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March/April 2007
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plus
InSync Home Brings Balance To Living & Technology
Optimum Performance Home™
part VIII
Volume 2, Number 2, Issue 08
March/April 2007
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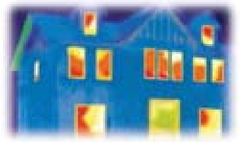

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WELCOME HOME March/April 2007

Features

30 ***The First Optimum Performance Home™— Interior Design Approaches And Materials, Part VIII***
By Gary Reber

25 ***Houses That Work For Life!***
By Lisa Sandlin

48 ***Lighting Design Process For The First Optimum Performance Home™***
By Patricia Rizzo, Sandhya Parameswaran, Rui (Nancy) Qi, Robert Soler & Justin Bosy

63 ***InSync Home Brings Balance To Living And Technology***
By Gary Reber

Cover Story

14 ***The New American Home® 2007***
By Gary Reber

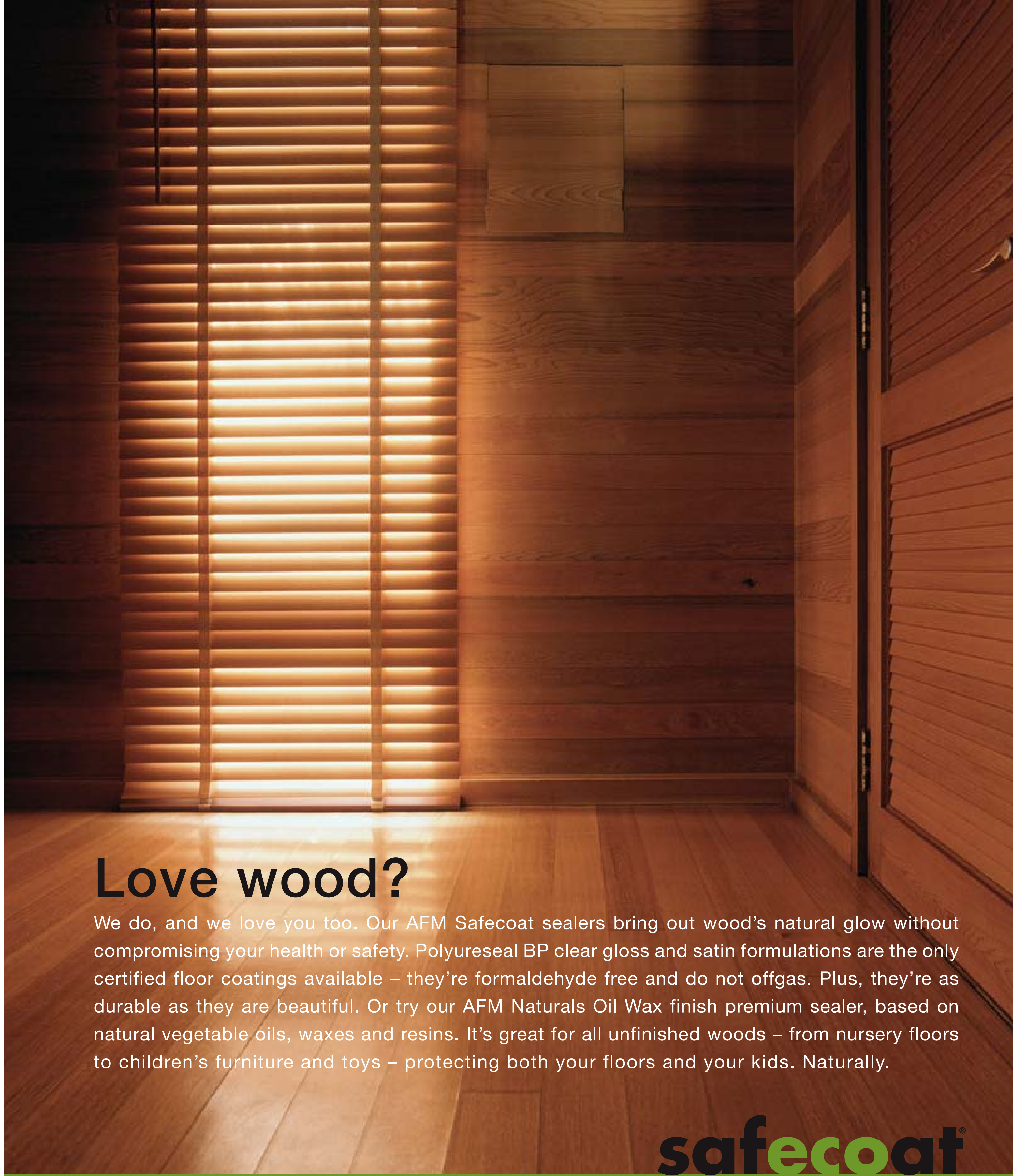
Departments

6 ***Acknowledgments***
Mission, Magazine Business Matters, Contributions, Subscriptions

8 ***Editor's Space***
Reflections & Directions

10 ***New To The Neighborhood***
By Sarah Scaglione
Manufacturers' Product Innovations Showcase

66 ***Advertisers' Information***



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VOLUME 2, NUMBER 2, ISSUE 8
March/April 2007

MISSION STATEMENT

The mission of *Ultimate Home Design* is to serve as a catalyst for homeowners to create demand for architects, designers, and builders to adopt the concepts and building practices that define human-centered, optimum-performance home design. *Ultimate Home Design* is aimed at broadening the segment of the American population that is paying closer attention to the products they buy, looking beyond price and branding to focus on other elements of the production and value chain. Increasingly homeowners want to support sustainable building practices that result in a higher living standard. *Ultimate Home Design* is for those homeowners who want to promote a broader shift in patterns of production and consumption by encouraging practices that better reflect their personal values. We are advocates for using products that reduce energy and use renewable, recycled content or otherwise environmentally preferable materials. An important part of our mission is to promote building practices that result in a substantial reduction in energy use for space conditioning, water heating, lighting, and appliance operation. Another important aspect of our mission is to promote construction practices that improve the indoor environment and reduce the risk of building-related illness. This translates to improved occupant health and comfort by improving thermal comfort; natural lighting and electric illumination; and controlling humidity, odor, noise, and vibration.

Ultimate Home Design is for the thinking homeowner, who wants to be educated and learn about intelligent options for home design, whole-house system design, and comprehensive electronic lifestyle features that can enrich the quality of day-to-day life while reducing the cost of operating a home. With the knowledge gained reading *Ultimate Home Design*, you will be empowered to make intelligent choices about the design and make-up of your home, whether considering remodels or additions, planning a new home, or evaluating an already-built home. *Ultimate Home Design* will explore the wide range of possibilities within the context of designing Optimum Performance Homes™ that integrate universal design architecture; sustainable green building materials and techniques; energy-efficient power systems for electricity, lighting, heating, and air conditioning; water conservation techniques; and comprehensive electronic lifestyle features.

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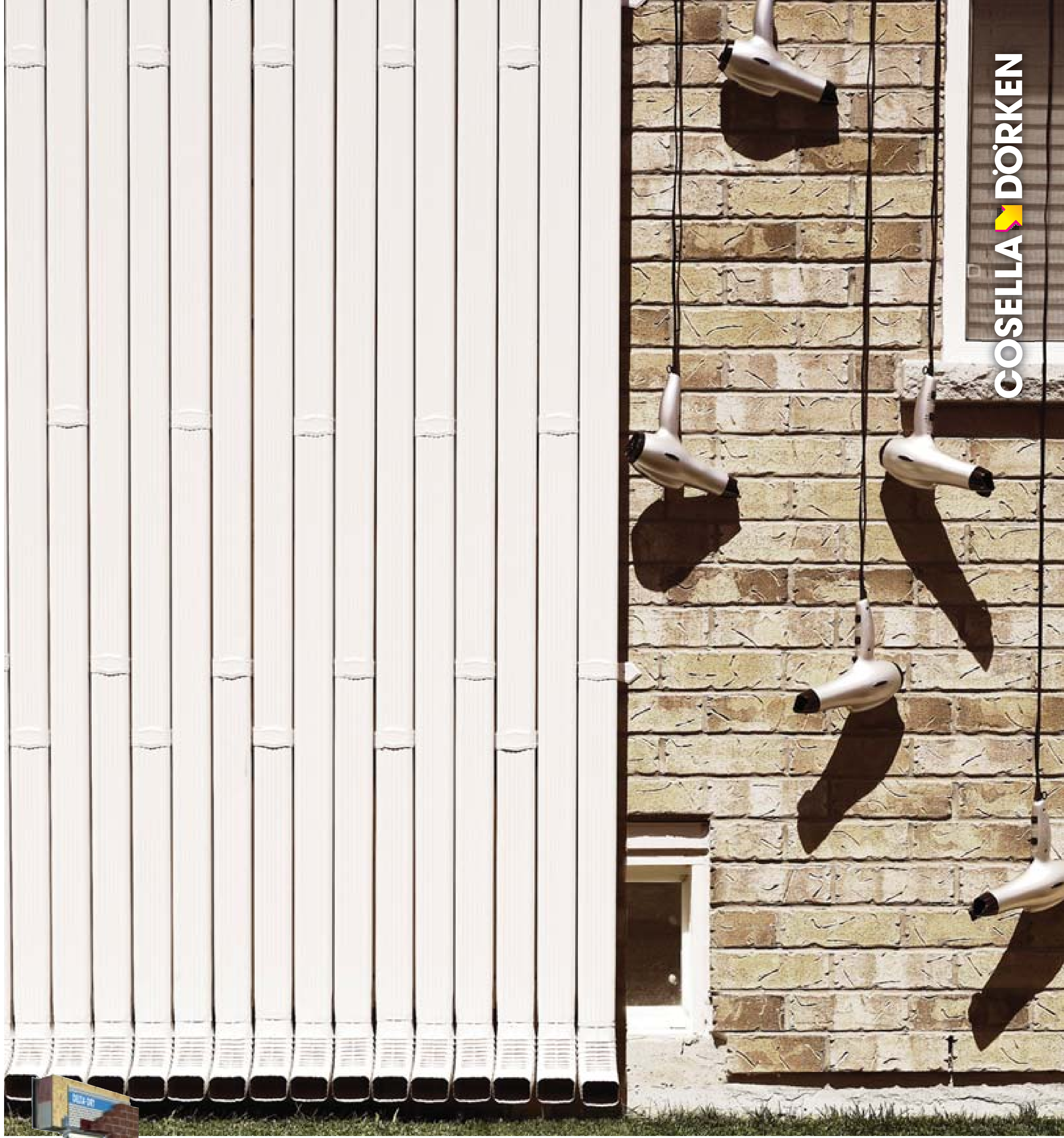

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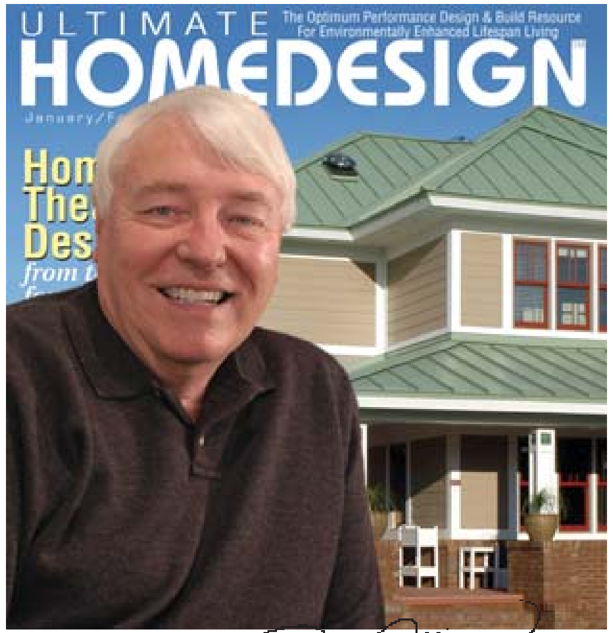


Home Design That Uses Less Electricity

As we continue our series of in-depth case-study articles on the design and building of the first Optimum Performance Home™, passive solar and biophilic design are concepts that, when successfully implemented, can result in significant electricity savings.

The provision of daylighting is an important design element in the design of an energy-efficient home. The idea is to optimize the capture of sunlight so that during the daytime, sunlight replaces electric lighting as the source of light throughout the home. Designing a home that optimizes natural lighting during the daytime is critically important to the successful passive solar performance of a home. The design must balance the desire to direct natural light in designated living spaces used during the daytime with the natural tendency that natural sunlight can produce solar heat gain. The benefit sought with a direct-gain passive solar design is to optimize heat gain with sunlight during the day to warm spaces to a temperature that is comfortable.

Along with the daylighting, an Optimum Performance Home should be designed to optimize biophilic benefits, including connecting the home's occupants with nature to ensure optimal physical and psychological health. (See Julie Pollack's articles, "Biophilic Design" and "Biophilic Design Attributes" in Issue 3, May/June and Issue 4, July/August, respectively.)

A home that connects with nature produces positive outcomes on health and healing, and significantly contributes to stress reduction. Homes should be designed with biophilic attributes that inspire interest in—and appreciation of —nature by all occupants, especially children.

The overall approach to the space design should be to consider occupant space needs and design for natural daylighting and biophilic features from the perspective of the interior out.

Designing for natural daylighting and biophilic attributes are the foundation of good home design. As a result, less electricity will be needed to power lights for daylighting, which can result in a significant saving over time.

This approach to home design is addressed in this issue in two articles: "Interior Design Approaches And Materials" and "The Lighting Design Process For The Optimum Performance Home."

Inside This Issue

Part VIII continues as a case study of the design and building of the first Optimum Performance Home, a Platinum-level LEED® for Homes project. In this part, I present the interior design approaches and materials to be used in the home. This includes the functional and aesthetic elements that windows and doors contribute; skylights and roof windows to connect occupants with nature and provide abundant sunlight; light-emitting glass-enclosed vestibule, walkway, and solarium; textural and color variances in natural flooring; and flooring finishes.

An informative article describing "The Lighting Design Process For The Optimum Performance Home" is featured as well. The home's lighting design depicted in the article was developed by graduate students from the Lighting Research Center at the Rensselaer Polytechnic Institute in Troy, New York. The students nailed our lighting vision for the home and provide excellent analysis of lighting challenges and solutions.

Our cover story is this year's New American Home, the official featured home sponsored by the National Association of Home Builders (NAHB) at the 2007 International Builders' Show held in Orlando, Florida in early February. The home project teams up industry experts for the purpose of designing, building, and monitoring a demonstration home that has been equipped with the latest marketable home technologies and products.

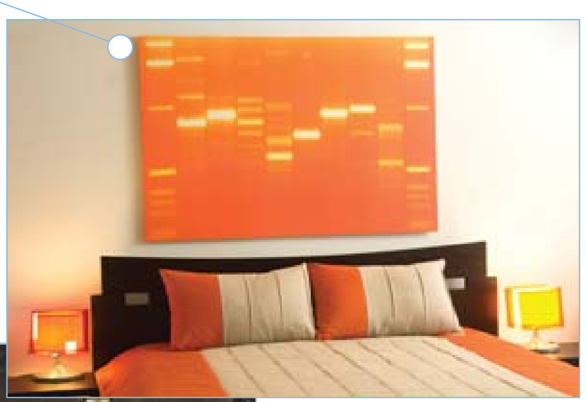
We also explore a bit of the control side of an electronic lifestyle home design with an article on the InSync Home, which integrates low-voltage technologies with a new level of control over lighting and distributed digital audio to every room in the house, employing Colorado vNet's integrated lighting control and Vibe™ audio systems.

Lisa Sandlin's "Houses That Work"explores home designs that function well and meet the needs of aging-in-place.

Thank you for your continued support. UHD

New to the neighborhood

Sarah Scaglione



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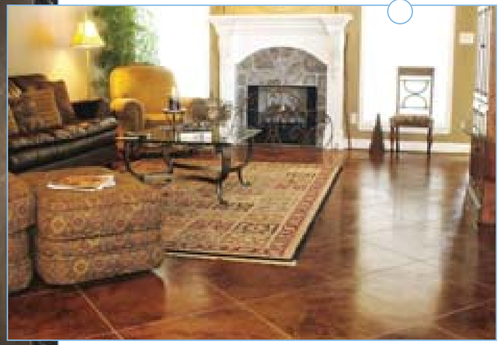

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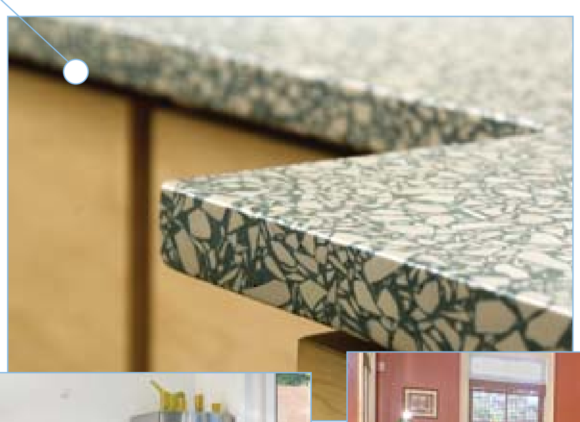
PRODUCT showcase



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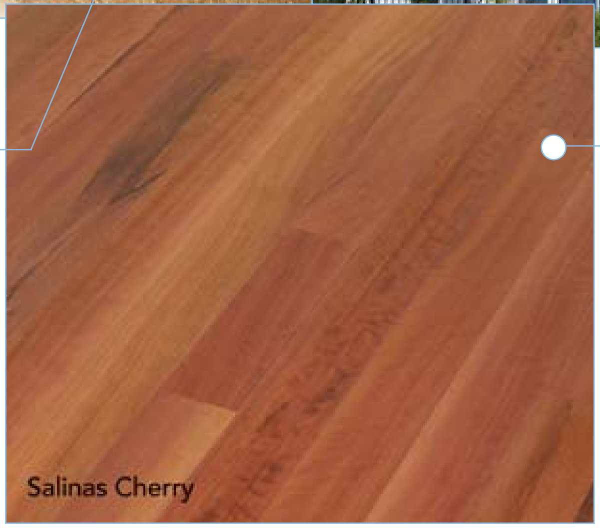

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Wood Floor Resource Group

Wood Floor Resource Group (WFRG) is committed to supplying innovative commercial and residential wood-flooring solutions to the design community. Composed of a team of wood-flooring professionals, WFRG specializes in assisting architects, designers, builders, and developers in making the appropriate wood-flooring selections for their projects. By utilizing WFRG's Product Selectors, specifiers can explore stock offerings, browse "eco" products with a variety of environmental attributes, as well as submit requests for custom products. In the market for LEED®-compliant flooring? The Eco Flooring Product Selector allows you to search products by LEED credit as well as by type of construction, finish, width, and installation method.You can even search by color. While WFRG is geared primarily to serving the design community, the company has a homeowner version in the works at www.ecoflooring.com. For more information, phone 609 589 3100 or visit www.woodfloorrg.com.

PRODUCT showcase

Takagi

Takagi, a leader in manufacturing tankless water heaters, recently introduced one of the smallest and most versatile residential tankless water heaters, the T-K3. At 13.8-inches wide and weighing only 40 pounds, this new water heater is cleverly designed to be recessed between two wall studs, making it virtually unnoticeable, and saving valuable space. This unit can provide an unlimited amount of continuous hot water because there is no storage tank to heat and reheat. With a natural flow-rate of 7.0 gallons-per-minute, this effective water heater has a thermal rating of 85 percent for liquid propane and 82 percent for natural gas, making it not only extremely efficient but also environmentally friendly. For more information, phone 866 356 9190 or visit www.takagi.com.

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UFLOOR Systems, Inc. introduces Pallman Pall-X 98 A/B, a water-based two-component wood-flooring finish with unmatched durability. Applied easily with a roller, Pall X-98 A/B dries quickly with a neutral odor and is especially suitable for surface treatment of sanded wood flooring in high-traffic areas. Combining components of A and B to form high-tech matte or semi-matte sealant, this product is ideal for heavy-wear wood flooring. For demanding situations, UFLOOR recommends Pall-X 98 A/B, after bonding with Pall-X Kitt and priming with Pall-X 340. This particular combination provides a systems-approach to challenging areas requiring high durability. For more information, phone 336 454 7000 or visit www.info@ufloorsystems.com.

Laticrete International, Inc.

Laticrete International, Inc. is a worldwide manufacturer of innovative systems for the installation of ceramic tile and stone. Showing its commitment to consumer quality, Laticrete announces the launch of one of the most comprehensive floor-warming products available, LATICRETE® FahrenHEAT™. Unlike traditional mats that require extensive stapling and are hard to install tile over, FahrenHEAT offers an exclusive self-adhesive mesh-and-wire backing that allows for easy thin-set installation with no waves. In addition to several innovations of the mat itself, Laticrete also offers 24-hour turnaround on floor layouts and offers an easy-to-use software program that allows customers to design their floor and identify product needs quickly and effortlessly. For more information, phone 800 243 4788 or visit www.laticrete.com.

2007 The New American Home®

Gary Reber

Demonstrating New Home Technologies

The New American Home® was the official featured home sponsored by the National Association of Home Builders (NAHB) at the 2007 International Builders' Show held in Orlando, Florida from February 7 to 11, 2007. This year's showcase is the most energy-efficient design in the history of the program.

Each year, since 1984, the NAHB builds a house in the host city of its International Builders' Show convention to demonstrate "state-of-the-art" home-building techniques, the use of innovative building materials, and leading-edge design, providing production home builders with an example for producing more energy-efficient, durable homes without sacrificing style. The mission is to show that "housing performance" can be incorporated into the most simple or most complex homes, and that it is equally as important as aesthetics.

The home is co-sponsored by The National Council of the Housing Industry (NCHI) and *BUILDER Magazine*. The majority of features and innovations in the home are accessible to both builders and homeowners for integration into their own homes. The home project teams up industry experts for the purpose of designing, building, and monitoring a demonstration home that has been equipped with the latest, marketable home technologies and products. The NCHI, a committee of the NAHB chartered in 1964, is comprised of nationally known, trusted, and recognized product and service suppliers to the housing industry who are committed partners. The design, construction, and amenities are market-driven, and showcase the latest in innovative products for the future of home building.

The design, construction, and amenities showcased are contributed by NCHI members, making The New American Home a highly visible in-kind sponsorship program. For a

complete listing of New American Homes built from 1984 to 2006 and under construction in 2007, and a list of NCHI members' participation in The New American Home by year, visit "Facts And History" on www.tnah.com.

The New American Home is located in the Lake Eola Heights Historical District in Orlando, Florida. This district is celebrated for its charming historical qualities and prized location near downtown Orlando, which is within walking distance. The home, built on an in-fill site one block from Lake Eola in downtown Orlando, is surrounded by upscale contemporary lofts, condominiums, and vibrant social and cultural activities. The area was developed between 1905 and 1925, with a blend of housing styles including Craftsman, Mediterranean Revival, Colonial Revival, and frame vernacular, many of which have been successfully updated through the years. From its tree-lined streets to its eclectic mix of architectural styles, this distinct district remains a desirable residential neighborhood for city dwellers that reflect the challenges and advantages of the "re-gentrification" movement regarding an in-city house.

Designed by Bloodgood Sharp Buster Architects & Planners, Inc., built by custom homebuilder Carmen Dominguez, with interior design/merchandising by Robb & Stuckey Interiors, and landscape architects Glatting Jackson Kercher Anglin Lopez Rinehart, the 2007 New American Home is a three-story, "urban loft" home with roof plaza, and features 4,707 square feet of A/C living area, plus a 576 square-foot suite above the detached two-car garage. The contemporary, urban-designed home has a thread of suggested history that is complementary with the architecture of Orlando's Lake Eola historic district.

By a quirk of fate, the historic district became the setting for not only the 2007 New American Home but also for the 2007 Renewed American Home (which will be featured in Issue 9, May/June 2007). The latter home demonstrates what can be done to update an older home.

The 2007 New American Home drew inspiration from a national trend: Homeowners are forsaking the suburbs to live downtown within walking distance of restaurants, parks, and entertainment venues. The home's architectural design challenge was to achieve an urban international-style home with a chic feel that will stand out, yet fit in with the surrounding historic homes. The show home features a single-family, three-story contemporary-style home in an urban setting and includes a basement, a detached two-car garage with living space overhead, a courtyard, and a roof plaza.

The first floor contains a home office, directly accessible from the street without compromising the privacy of the residents, a media room supported by a small kitchen for entertaining, and two bedrooms connected by a Jack & Jill bathroom. As with the entire house, this zone is universally accessible, providing accommodations for a round-the-clock caregiver, should the need arise. A laundry room and mudroom complete the floor plan.

The master suite fills the entire second floor. Accessible by an elevator that services all three floors, this area contains a lounge, morning kitchen, bedroom, bath, outdoor shower, patio, and laundry room. The lounge area, located in the front of the house, opens to a grass-covered deck that looks over the neighborhood.

The top floor is completely open, providing a huge family room and a state-of-the-art kitchen for intimate family use or major entertaining. A bathroom and a laundry room complete the scene. A large open, grassed deck fronts the building, offering a combination of an outdoor kitchen and sweeping views of Lake Eola.

Synopsis

- ***The design, construction, and amenities are market-driven, and showcase the latest in innovative products for the future of home building.***
- ***The low-voltage systems in the residence were designed to demonstrate the latest technology available to home builders and homeowners that enhances the livability and eases the complexities of modern home control.***
- ***Combined with new ideas for universal design, energy efficiency, and technology, the home's design and floor plan, brings to life the idea of a lifestyle that today's home-owners demand.***
- ***The home uses approximately 73 percent less energy for heating and cooling and 54 percent less energy for water heating, compared to a house of comparable size in the hot humid climate region.***

> "The New American Home's mission is to show that 'housing performance' can be incorporated into the most simple or most complex homes, and that it's equally as important as aesthetics."

International Builders' Show

Each year for the International Builders' Show, The New American Home® transforms from a graded plot into a truly unique home in style and function. The one characteristic shared by each home since the U.S. Department of Energy's Building America Program has participated in the project is energy efficiency. This year's home achieves high levels of efficiency through advanced HVAC equipment, careful installation of insulation and air sealing, high-performance windows, and a zone control system. Among its interesting features is a hot water system that taps energy from solar thermal panels. The home's overall achievements in energy use are 73 percent reduction in heating and cooling and 54 percent reduction in hot water, when compared to a similar home.

A Strong Energy Portfolio For A Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

Research And Development Of Buildings

Our nation's buildings consume more energy than any other sector of the U.S. economy, including transportation and industry. Fortunately, the opportunity to reduce building energy use—and the associated environmental impacts—are significant.

DOE's Building Technologies Program works to improve the energy efficiency of our nation's buildings through innovative new technologies and better building practices. The program focuses on two key areas:

• Emerging Technologies

Research and development of the next generation of energy-efficient components, materials, and equipment

• Technology Integration

Integration of new technologies with innovative building methods to optimize building performance and savings

For more information, contact EERE Information Center at 877 337 3463 (www.eere.energy.gov)

Primary Project Goals:

• Build a high-profile show home for the International Builders' Show by implementing Building America strategies to conserve energy and materials

• Introduce production builders to advanced HVAC strategies and advanced insulation and airtightness detail

Specifications:

• Pre-cast, insulated structural concrete wall system
• Three high-efficiency heating and cooling units, heat pumps 9.0 HSPF
• Air-conditioning systems between 15 and 17.8 SEER
• Air-distribution system entirely within conditioned space
• Low-emissivity impact-resistant windows, U-value = 0.33, SHGC = 0.32
• Four-foot overhangs over most south- and west-facing windows
• Natural gas-fueled instantaneous water heaters, EF = 0.82
• 2.4-KW solar photovoltaic system
• 49 percent whole-house energy savings (58 percent with PV system contribution)

The rear of the house opens to a walled landscaped garden that features a small pool and waterfall, and provides access to the detached garage. The second floor of the garage contains a spacious apartment and a private deck that overlooks the nearby lake.

The 2007 New American Home features residential automaton and home control for all low-voltage systems. The low-voltage systems in the residence were designed to demonstrate the latest technology available to home builders and homeowners that enhances the livability and eases the complexities of modern home control. The home is intended to showcase the latest products in the industry and set a benchmark for low-voltage design techniques.

Among the installed systems are structured wiring, security/life-safety, multi-zone audio, home theatre, lighting control, and flat-panel displays. Structured wiring refers to all low-voltage wiring in the walls that provides audio, video, phone, security, and network access, as well as the components that link the wiring to its destination or termination point. Security and life-safety systems refer to the security system, pool alarm, smoke and CO detectors, and any other device designed to improve the safety of the inhabitants. Electronic System Design (ESD) designed the electronic lifestyle systems. The components were provided by Cutler-Hammer and Honeywell. The multi-room audio system uses Elan Home Systems System 12, a premier multi-source, multi-zone system that allows the homeowner complete access to all music, video, and communications in the home. Dell supplied the HDTV flat panel displays throughout the home. The home theatre and other equipped room systems feature Bose Lifestyle® BUILT-invisible® Home Theater system 6748 components and a uMusic® intelligent 340 CD playback system and Lifestyle® Media Center, all easily accessible throughout the home. A Bose 5200 Outdoor Music System provides access to the music stored in the Family Theatre media center to the Butterfly courtyard outside the home.

Combined with new ideas for universal design, energy efficiency, and technology, the home's design and floor plan, brings to life the idea of a lifestyle that today's homeowners demand.

The 2007 New American Home is designed with universal design compliance and designated to be ENERGY STAR® certified, and also certified as a "green" or environmentally friendly home under standards set forth by the Florida Green Building Coalition, an organization dedicated to eco-friendly construction practices. Among the home's green features are a solar photovoltaic (PV) system, impact-resistant windows, a generator, and a cistern that will collect rainwater for irrigation.

To ensure energy efficiency and innovation, two Building America teams worked closely with the National Council of

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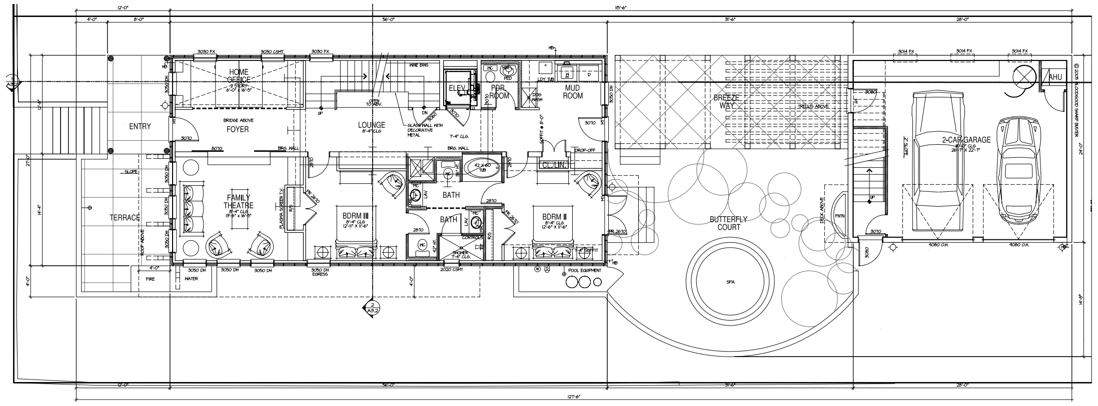
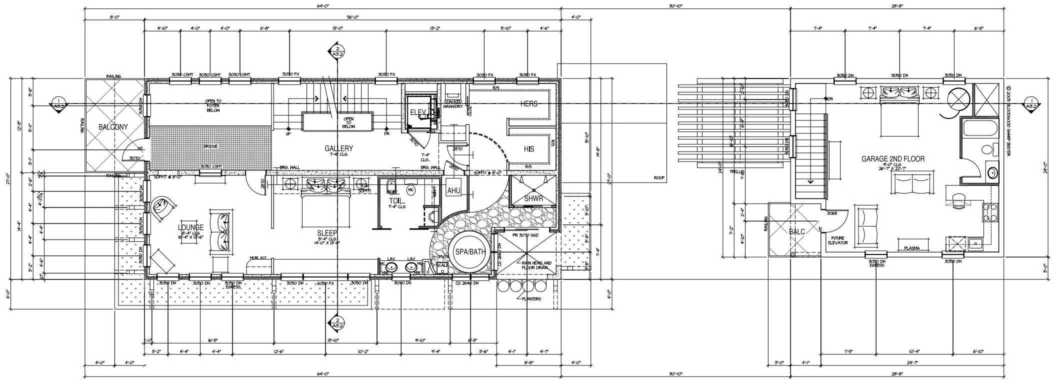
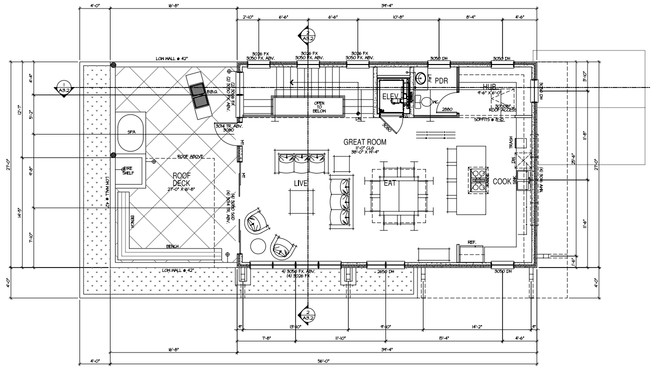


The ground-level floor plan of The New American Home® 2007 exhibiting a linear layout with the home office and family home theatre located at one end. Note the universal design and access to the elevator and stairs at the center of the home.



The second-story floor plan of The New American Home® 2007 is an entire floor dedicated to the master suite and lounge.



The third-story floor plan of The New American Home® 2007.

the Housing Industry. IBACOS Inc. provided design and engineering support, and the Industrial Housing Partnership provided performance testing and consulted with the builder regarding the use of solar photovoltaic systems. As a result, the home's three stories are conditioned using three strategically placed, high-performance HVAC systems. The shallow basement, first floor, and second floor are served by two heat pumps with 17.8 SEER performance, while the third floor is served by a 15 SEER gas/electric unit. Each unit and its associated ductwork are within conditioned space. A solar thermal hot water system preheats incoming water for the Rinnai tankless water heaters, which are fueled by natural gas—further adding to efficiency and comfort. A 2.4 kW photovoltaic system lightens the electric energy load by 9 kW hours per day on average.

Other prominent features further contribute to energy efficiency and durability. The exterior is constructed with precast, insulated concrete sandwich walls (equivalent thermal performance to R-26 wood-framed walls), and the home is built on a solid foundation of precast concrete walls with R-5 exterior insulation. For the fourth consecutive year, the New American Home features a structural concrete wall system constructed with the Dow T-Mass technology, supplied by Standard Precast. The home also features structural hollow-core flooring planks provided by Gate Concrete Products. Other concrete products include stucco with Essroc Cement's pollution-fighting "TX Aria" cement, fiber-cement siding, retaining walls, and concrete pavers. Both the Portland Cement Association (PCA) and the Precast-Prestressed Concrete Institute (www.pci.org) are project sponsors.

All of the windows and sliding doors, supplied by Andersen Window, Inc., are impact-resistant and have low-emissivity (low-E) coating to limit solar heat gain and provide storm protection. In addition, windows on the south- and west-facing sides are covered by overhangs that include a layer of vegetation (green roof concept). Last, but not least, fluorescent lighting and lower wattage incandescent lamps provided by Progress Lighting to save electricity and provide cooler indoor conditions.

The energy features in The New American Home can be used in homes at any price-point with equivalent energy savings.

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Building America's Systems-Engineering Approach

Building America (www.buildingamerica.gov) is a research program of the U.S. Department of Energy (DOE) with the goal of designing and building zero-energy-cost homes. Building America's systems-engineered approach unites segments of the building industry that have traditionally worked independently of one another. Building America forms teams of architects, engineers, builders, equipment manufacturers, material suppliers, community planners, mortgage lenders, and contractor trades.

The concept is simple: systems-engineering can make America's new homes cost-effective to build and energy-efficient to live in. Energy consumption of new houses can be reduced by as much as 50 percent with little or no impact on the cost of construction.

To reach this goal, Building America teams work to produce homes that incorporate energy- and material-saving strategies from design through construction.

First, teams analyze and select cost-effective strategies for improving home performance. Next, teams evaluate design, business, and construction practices within individual builder partnerships to identify cost savings.

Cost savings can then be reinvested to improve energy performance and product quality. For example, a design that incorporates new techniques for tightening the building envelope may enable builders to install smaller, less expensive heating and cooling systems. The savings generated in this process can then be reinvested in high-performance windows to further reduce energy use and costs.

The "pilot" or "test" home is the field application of solution design. Teams build prototype homes according to strategic design, then test each system for efficiency, and then make any necessary changes to increase efficiency and cost effectiveness. Before additional homes are built, these changes are incorporated into the design. This process of analysis, field implementation, re-analysis, and design alternation facilitates ultimate home performance, once a design is ready for use in production or community-scale housing.

Understanding the interaction between each component in the home is paramount to the systems-engineering approach. Throughout design and construction, the relationship between building site, envelope, mechanical systems, and other factors is carefully considered. Recognizing that features of one component can dramatically affect the performance of others enables Building America teams to engineer energy-saving strategies at little or no extra cost.

Advantages To The Homeowner:
- Increases quality without increasing cost
- Increases comfort and performance
- Reduces utility bills
- Allows greater financing options

Advantages To The Builder:
- Reduces construction costs
- Improves productivity
- Improves building performance
- Reduces callback and warranty problems
- Allows innovative financing as a result of predictably lower utility bills
- Gives builder a competitive advantage

Energy Features And Benefits

Among the top benefits of The New American Home is energy efficiency. The home uses approximately 73 percent less energy for heating and cooling and 54 percent less energy for water heating, compared to a house of comparable size in the Hot Humid climate region. Each component of the home was selected and integrated into the project through a systems approach of designing, testing, and re-designing. All of its components work together to achieve maximum performance. For example, the home's thermal qualities are achieved by property-sizing the mechanical equipment, using the right insulation materials and specifications, and designing the ductwork to fit within the conditioned space.

New Realities For Boomers

The first wave of America's 76 million-plus "baby boomers" turned 60 last year. As this group heads into retirement, they're having a profound effect on the housing market, and their needs and preferences are shaping the way that developers, architects, and architectural designers are building homes.

Baby boomers have a different view of age-restricted housing than their parents' generation. A new emphasis on active living has made communities with recreational amenities like golf, biking, fitness centers, and nature trails more popular. More and more boomers, especially at the younger end of the spectrum, are choosing multi-generational communities that market to buyers of all ages, and homes that will accommodate their needs as they move through their child-raising years and into "the next stage" of their lives, which may or may not include retirement. Many of these families will have the added demand of providing for adult children and grandchildren returning to the nest and/or accessible housing for aging parents. That plays into the recent trend toward larger retirement homes and the application of "universal design" principles to architectural plans.

The New American Home anticipates and plans for these changing realities for "boomers." The home—with ThyssenKrupp elevator—was designed to be almost 100 percent wheelchair accessible, so it will be suitable for the resident as he or she ages or brings an elderly parent into the home. A fully equipped guest suite over the detached two-car garage could easily serve as an in-law suite for guest, live-in housekeeper or caregiver, returning children, or senior housing for parents.

Conclusion

The 2007 New American Home is exemplary of large-home architecture incorporating new concepts, materials, and techniques that improve energy efficiency and home performance applicable to homes in any size or price range. UHD

About The Author

Gary Reber is the President of Ultimate Home Design, Inc. and the founding Editor-In-Chief and Publisher of *Ultimate Home Design* magazine. His diverse background in several fields includes an undergraduate, graduate, and postgraduate university education in architecture, community planning, and economic development planning. For years he was a consultant on community and economic development planning. For the past 15 years he has been an editor and publisher of magazines in the consumer electronics field. Gary can be reached at 951 676 4914 or gary@ultimatehome-design.com.

Acknowledgments

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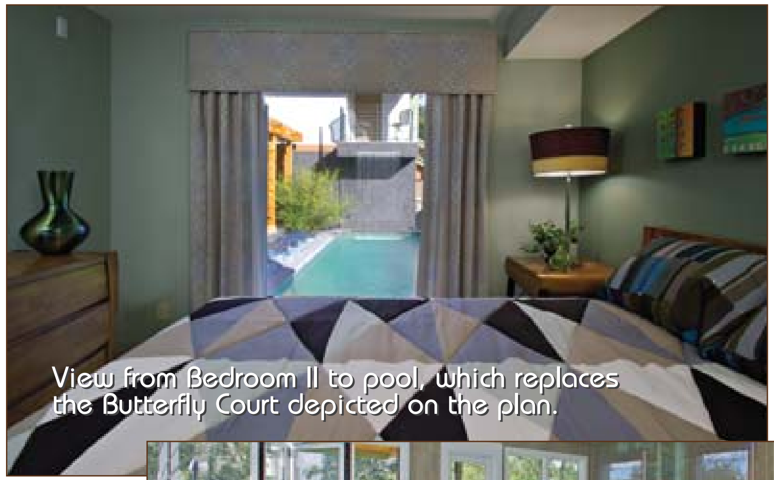
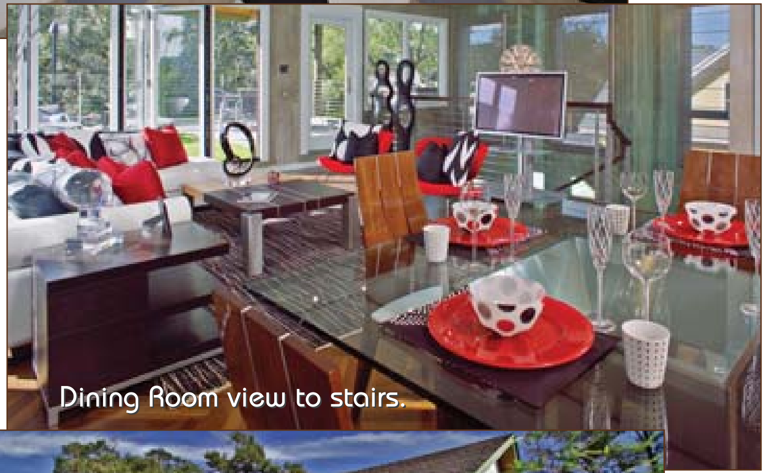
U.S. Department of Energy's National Renewable Energy Laboratory

DESIGN
optimum performance home



View from Bedroom II to pool, which replaces the Butterfly Court depicted on the plan.



Dining Room view to stairs.

Exterior view of first floor terrace and pool.

The Granny Suite over the two-car garage.

Building America's Systems—Engineering Approach (continued)

Systems Engineering Cost Saving Trade-offs:
- Advanced framing systems
- Tightly sealed house envelopes
- Shorter, less costly ductwork
- Engineered and planned infrastructure
- Smaller, less expensive mechanical systems
- Modular construction

Percentage Of Energy Reduction
- 73 percent reduction in heating and cooling energy use
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- IBACOS Consortium—800 611 7052 (www.ibacos.com)
- Industrial Housing Partnership (IHP) 407 384 2048 (www.eere.energy.gov/buildings/building_america/ihp.html)

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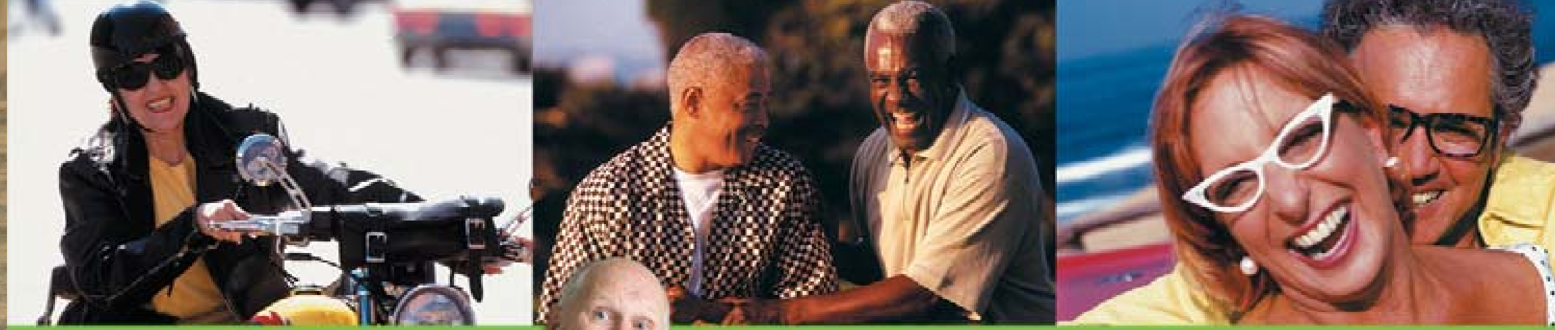

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For more information and to register visit www.nahb.org/build4boomers

2007 The New American Home®

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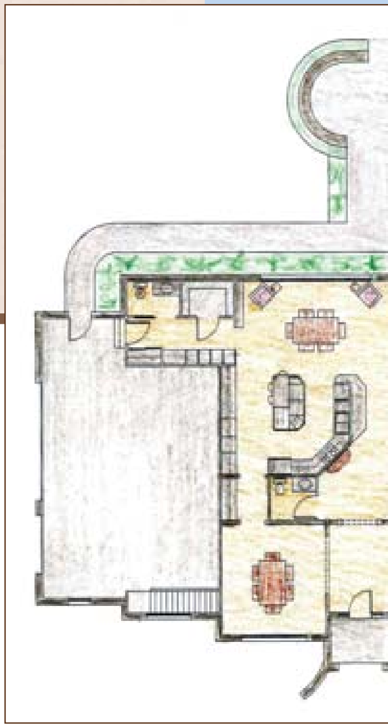
HOUSES THAT WORK *for life!*

Lisa Sandlin

(Figure 1) A Plan That Works



synopsis

- *Unless young adults have experienced an injury, a major surgery, or the need for an elderly parent to reside with them, they just can't relate to the difficulties that one can encounter while living in a typical market home.*
- *The transgenerational approach to residential design, along with universal design, inclusive design, and transformable design, are way ahead of the typical and standard approach to the housing market.*
- *Different space adjacencies and new activity requirements for today's lifestyles, and consideration of the needs of the future, play a huge role in empowering design.*

A house that is comfortable, secure, personalized, familiar, and offers us sanctuary from the rest of the world, is a home. The Ultimate Home should also be an empowering home, a place that embraces us and offers us support for the activities and tasks required within its spaces, regardless of our age or ability.

Typically, every room in the home has been built around an activity or task. The space is commonly described by its usage. The family room is where the family gathers. The bathroom is where one grooms. The laundry room is where the clothes are laundered. The bedroom houses the bed. You get the idea. These rooms are spaces designated within the home for certain activities to occur.

As cultural demands in housing evolve, so do the homes. The master bathroom of today's average-market house is quite glamorous compared to the bathrooms of the sixties and seventies. The gathering spaces are grander, and the kitchens are designed for the gourmet chef. But does all of this extravagance make these spaces function any better? To a certain degree, at least for the typical, able-bodied user, which the market is currently geared toward, it does. However, with a new design approach, it could function a lot better.

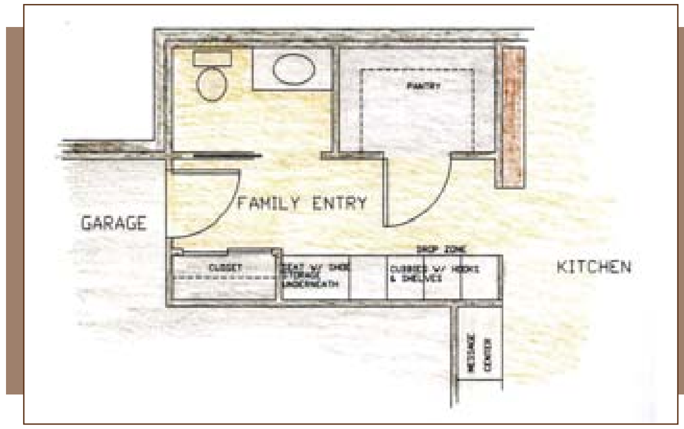
The current market is driven by young adults venturing into homeownership for the first time, or moving up into their dream "cookie-cutter" mass-produced developer-built home. This generation usually doesn't consider the challenges that life can bring. They want the most square footage for the least cost. Unless they have experienced an injury, a major surgery, or the need for an elderly parent to reside with them, they just can't relate to the difficulties that one can encounter while living in a typical market home. The result is an influx of market houses based on the typical standards in residential design that do not function as well as they should, and definitely do not meet the needs of our aging or physically-challenged population.

> "The Ultimate Home should also be an empowering home, a place that embraces us and offers us support for the activities and tasks required within its spaces, regardless of our age or ability."

The transgenerational approach to residential design, along with universal design, inclusive design, and transformable design, are way ahead of the typical and standard approach to the housing market, but, in my opinion, are still lacking in the traditional feeling of "home" that most of the market still demands.

As the daughter of a retired custom-home builder, I have had an inside view of the housing industry my entire life. After becoming a wife, mother, caregiver, and homemaker, I decided to enter the design field and try to make some seriously needed changes. Throughout my eight years of formal education and several years of practicing residential design, I have developed a unique design philosophy, which I refer to as empowering. I challenge the standard and typical practices of residential design, and even though I strongly agree with the universal, inclusive, transformable, and transgenerational design approaches, I still think we can do better.

We need to truly examine today's lifestyle and the new requirements it brings. Different space adjacencies and new activity requirements for today's lifestyles, and consideration of the needs of the future, play a huge role in empowering design. We become empowered by rethinking the typical and by demanding that our homes support our needs as those needs change, instead of us being forced to adapt to the houses.



(Figure 2) Family Entry

Some examples of these needs are:

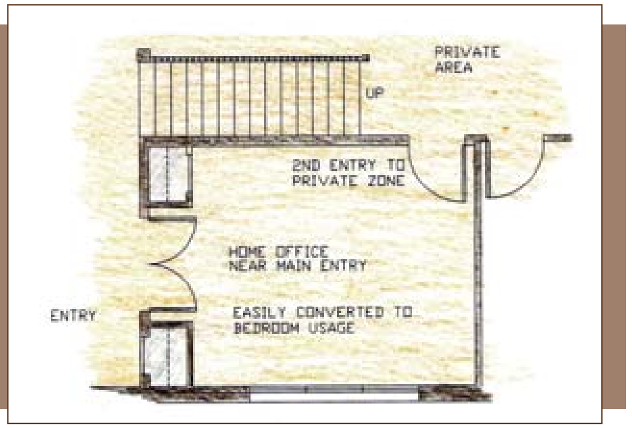
The Family Entry

What area of the home do we, the family, enter and leave from? Usually, it is the laundry or mudroom that is adjacent to the garage, making these spaces the most-used entry for the family. In most areas, the residential building code requires a level change from the garage to the living area of the house. For extenuating circumstances, this code can be circumvented, and an on-grade entry is possible. When a home is built on a basement, the level change is usually three steps, thus creating quite a challenge for the designer to create an accessible entry. Often ramps are used, but they take away a lot of square footage from the garage's usable space. On-grade or level entries can be obtained at other entry doors by gradually ramping walkways. Proper lighting is essential in all of these areas.

As part of my design practice, I always treat the family entry with as much importance and dignity, or even more, than the formal entry or foyer of the home. The family that dwells there should experience a pleasant and welcoming place as they come and go from their home. The family entry becomes empowering when all members have a special place for the items that they typically take to and from the home. I refer to this place as the "drop zone," which also helps relieve the clutter on the kitchen counter. The family entry should also have an adjacent bathroom facility, a coat closet, and shoe and boot storage. Near the kitchen, a place to sit should be provided, such as a window seat for putting on or taking off shoes. When carrying groceries and other supplies into the kitchen, one should never have to traverse across the house.

The Home Office

Now, more often than not, both the husband and the wife are employed, sometimes outside of the home and sometimes within. Therefore, the need for an empowering home office space is increasing. A home office should be designed with



(Figure 3) Home Office

as much consideration to human factors and ergonomics as any office or workstation outside of the home. Currently, a spare bedroom is most often used as the home office, but it does not provide many of the features required to function as well as a home office should. If a separate space is provided, it needs to be easily converted into something else when the use of a home office is no longer needed.

Safe And Empowering Bathing Quarters

Many transgenerational families are co-habitating, thus requiring additional living quarters on the main level of the home. These quarters must be designed with an aged occupant in mind. Most designers are trained in meeting the requirements for the Americans With Disabilities Act (ADA) in commercial work, but most do not even consider ADA in residential design, unless designing for someone who currently is disabled.

An accessible bathroom does not have to appear institutional or sterile. A luxurious-looking bathroom can still be enabling for the user, if designed with safety and accessibility in mind. In my practice, we try to implement as many ADA requirements as possible, without creating an institutional-looking space. I also consider safety features for all occupants to be very important. Grab bars have become standard in all bathing areas. Nonskid flooring surfaces, showers with a 36-inch door, curbless entry, and a built-in seat are a must. Adjustable hand-held shower heads with levered scald-proof controls, and built-in shower and shampoo holders that do not protrude into the space, are typical. Vanities with varied height, appropriate task and ambient lighting, and storage for linens and medicines are some of the typical design features offered.

Bathrooms should never have a door that swings into the usable space. Most of us go into the bathroom whenever we feel ill, resulting in many heart attacks and other serious situations occurring in that space. If the door swings into the bathroom space and the occupant is collapsed on the floor, the paramedics must remove the door from the hinges to reach the afflicted person. This can take several minutes of critical time that could result in tragedy. If a pocket door is used, the door simply recesses into the wall, making a clear path for the help to arrive. The pocket door is also very effective for wheelchair users and other occupants.

The Kitchen

Though seldom used by many in today's lifestyles, compared to its use historically, the kitchen is still considered the heart of the home. Most people entertain in this space because this is where most people want to be, it's where the food and action are. This space requires special design consideration because of the multiple uses, cooking, and task requirements that occur here. Children can feel alienated in a kitchen with high counter tops and no place for them to see what's going on, or to be able participate in the activities. An elderly person might be more than willing to help prepare the meal, but cannot stand for very long periods of time, and needs to be seated while working. Multiple cooks need multiple workstations. When designed properly, the kitchen can become a very empowering place for all who use it.

Today, it has become quite the norm for more than one person to be using the kitchen at the same time. Standard design practice for a kitchen places the appliances in a triangle for optimum use. Since more than one worker is commonly in the kitchen, more than one triangle needs to be planned. A typical triangle is the relationship of the stove to both the refrigerator and the sink. Today, it is common to have a second sink placed in a center island or peninsula. To create an empowering kitchen, we must investigate different relationships and offer several types of workstations for the many types of people that will be using the space. Universal or accessible design requires a sink that has an open cavity below to accommodate a seated person. Children need a lower sink or a way to step up to the sink. Adjustable sinks are on the market, but are quite expensive. In smaller kitchens, the storage space would be compromised without the use of the area under the sink. An empowering kitchen would offer both, a sink with an open space below and a sink with storage and a built-in step.

If the budget does not permit the installation of two sinks, the one with storage will usually override the need of an accessible sink. This sink cabinet should be installed in a manner that allows it to be changed easily to an accessible sink, if needed in the future. Empowering design also considers how standard cabinetry can be made better. A fake drawer front is standard for a sink base cabinet. But when the drawer is placed below the open cavity, two things happen: the storage space rises, making it easier to access for most

users, and it provides storage for dish towels. With a little modification, the lower drawer can be converted into a step for little ones to stand on and reach the sink. This concept is empowering for many users.

Empowering design strives to implement universal, inclusive, transformable, and transgenerational design in as many ways possible, without compromising the budget and the feel of a traditional home. It focuses in-depth on how we really live in today's culture, and what current needs and future needs should be addressed.

As designers, we learn to truly see the built environment. Through this in-depth exploration of the world around us, our goal is to improve the home environment. The practice of post-occupancy evaluation aids designers in reaching this goal. Post-occupancy evaluation is the process of extensive research to evaluate a building's performance after its completion. Designers study usage patterns and conduct informing interviews with the building's occupants. This practice is virtually non-existent in most residential design, but should be included in every home design process.

As a designer, I am honored when my clients feel that together we have designed the best possible home for them, both for today and for their future. The best compliment any clients can give me during the post-occupancy evaluation is: they wouldn't change a thing, and this home is easier to live in than any other they have ever resided in. UHD

(Figure 4) Empowering Bathroom

(Figure 5) Empowering Kitchen

The Author

Lisa Sandlin specializes in universally designed homes, which are easily adapted as occupants' needs change over time. Mrs. Sandlin holds a Bachelor's Degree in Interior Design and a Master's Degree in Architecture from the University of Cincinnati (Ohio). She is the principal designer of Lisa Sandlin Design, established in 1992 and has been designing residences that empower people throughout her career. Mrs. Sandlin believes that teaching clients and students is an important part of her career and has served as an adjunct instructor at The University of Cincinnati and Miami University since 1999.

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The First Optimum Performance Home™

interior design approaches and materials part VIII

Gary Reber

synopsis

- An important design element is the provision of daylighting, so that during daylight hours sunlight is the source of light instead of electric lighting.
- The Optimum Performance Home has been designed to optimize biophilic benefits, including connecting the home's occupants with nature to ensure optimum physical and psychological health.
- The design of room configurations was done in conjunction with daylighting opportunities, and took into account window, door, and skylight locations, and the arrangement of furniture and internal spaces within rooms.
- The Optimum Performance Home is a full-blown passive solar design with the glazing area, air circulation patterns, and use of thermal-storage materials carefully planned to harness sunlight to provide daylighting and controlled heat, and to channel breezes off the Pacific Ocean to provide fresh air ventilation.

Introduction

This is the eighth article in the series documenting the design and construction of the first Optimum Performance Home™. The project has been selected by the U.S. Green Building Council (USGBC) for inclusion in the national Leadership In Energy & Environmental Design (LEED®) for Homes pilot program, their new green build certification initiative, and its goal is Platinum certification.

The home will be built at The Sea Ranch, located in Sonoma County, along the Northern California coastline of the Pacific Ocean, approximately 110 miles north of San Francisco.

The showcase project is exemplary of the "Ultimate Home Design™" concept, which integrates age-friendly universal design with the best sustainable building practices, while exerting minimal impact on the environment. Universal design is the inclusive, non-discriminatory design of products, buildings, environments, and urban infrastructure, as well as information technologies that are accessible to and useable by (almost) all. With respect to home design, the idea is to design and build homes that have no physical barriers, thus sustaining people of all ages and all capabilities in a functional, comfortable, and aesthetic lifestyle.

A building science systems approach to home building is the cornerstone of the project, with emphasis on the relationship between the home's components and the envelope they create. Also paramount is good stewardship—proper regard and respect for the rights of neighboring homeowners and the surrounding natural setting, and resource efficiency. The goal is to optimize occupant health, comfort, and safety; maximize energy efficiency and structural durability; and minimize environmental impact. In addition, the aim is toward providing a nurturing home environment to support independent living and sustainable lifestyles.

Part I of this case study series appeared in Issue 1, January/February 2006. The introductory article extended to 16 pages and extensively covered the project scope. Thereafter, each issue has contained a part of the continuing series working through site planning and preparation; Low-Impact Development (LID); further refinements to the site plan and drainage design; The Sea Ranch Design Committee approval of the architectural/structural and grading/drainage submittals with conditions that translated to clarifications on certain building components and material finishes; particular aspects of the home's mechanical plan; structural aspects of foundations, structural walls incorporating Insulating Concrete Forms (ICFs) and Structural Insulated Panels (SIPs), and roofing; and the acoustical design of the dedicated Optimum Performance Home Theatre™ and rear-projection room.

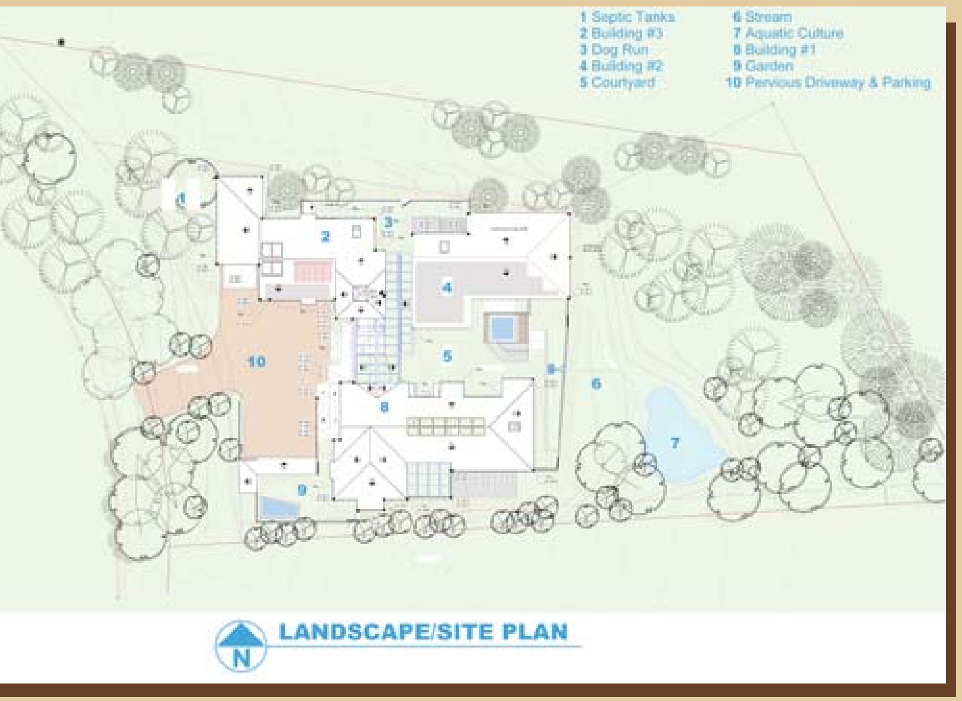
A Final Approval letter for The Sea Ranch Association Construction Performance Permit was issued on October 11, 2006, which is required by Sonoma County to obtain a county building permit.

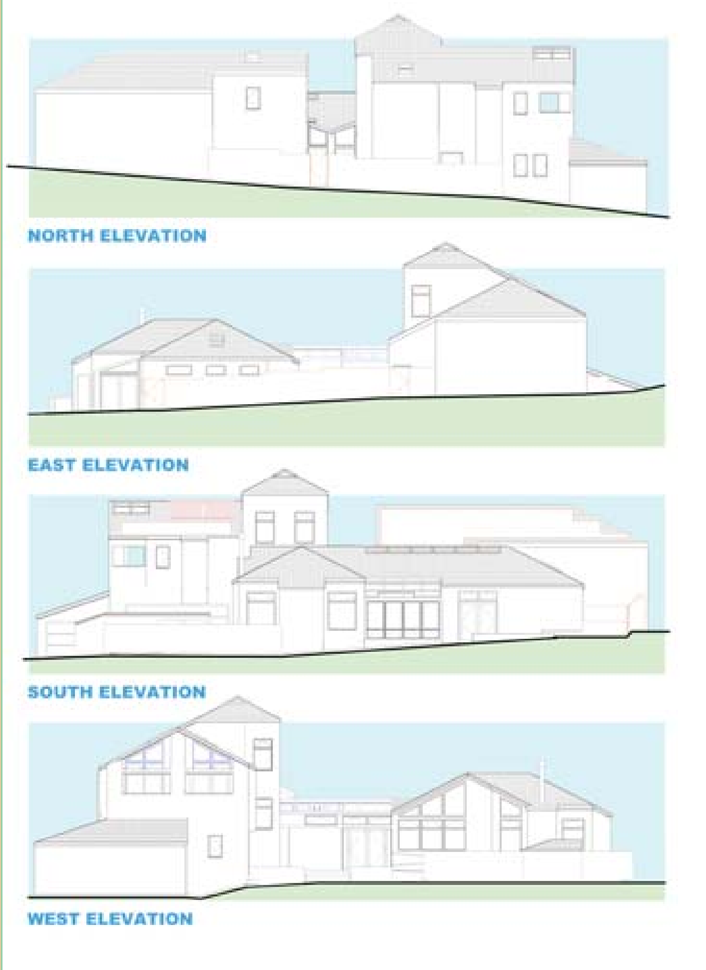
The necessary work to obtain the building permit, including further refinement of the structural and mechanical plans, has been completed. Final construction plans are now in the review process with the Sonoma County Building Department and Third Party Plan Check Review. Assuming no further delays, the issuance of permits, the commencement of construction, site grading, foundation, and mechanical infrastructure could start in late March or April 2007.

In this segment, the focus will be on windows and doors, skylights, vestibule and walkway design, solarium design, and floor treatment.

> "The overall approach to the space design of the Optimum Performance Home was to consider occupant space needs and design from the interior out."

The Sea Ranch, Sonoma County, California





The elevations of the Optimum Performance Home at The Sea Ranch

Design Concept

As previously noted in this series, the home design integrates all of the concepts advocated in *Ultimate Home Design*. The goal is to demonstrate how today's products and building methods can make life safer, more comfortable, and more enjoyable. The science of optimum performance homes is about building structures that use less energy, are quieter and more comfortable, have fewer problems with material degradation, provide clean air and water, and do less damage to the environment. As an integrated holistic design, the house will serve as a home for many people and serve in many phases of one's life.

The high-performance building systems that will be employed exceed what the building codes require, and are able to resist natural disasters more effectively than a code-minimum house. Greater home safety—and thus, homeowner peace of mind—is possible when building with stronger materials and techniques. The Optimum Performance Home qualifies for the Fortified…For Safer Living® program of the Institute for Business & Home Safety (www.ibhs.org/business_protection). This program specifies construction, design, and landscaping guidelines to increase a new home's resistance to natural disaster from the ground up.

The home will also meet the guidelines and qualifications for the U.S. Department of Environmental Protection's ENERGY STAR®, the EPA's WaterSense, and the American Lung Association® Health House® programs. As well, the home will meet the "Green Points" program now being considered for adoption by Sonoma County and The Sea Ranch Association.

The Optimum Performance Home's site plan is designed to strongly support the efficient use of the community's water supplies, equitable allocation of water resources provided by the community and harvested on site, elimination of water

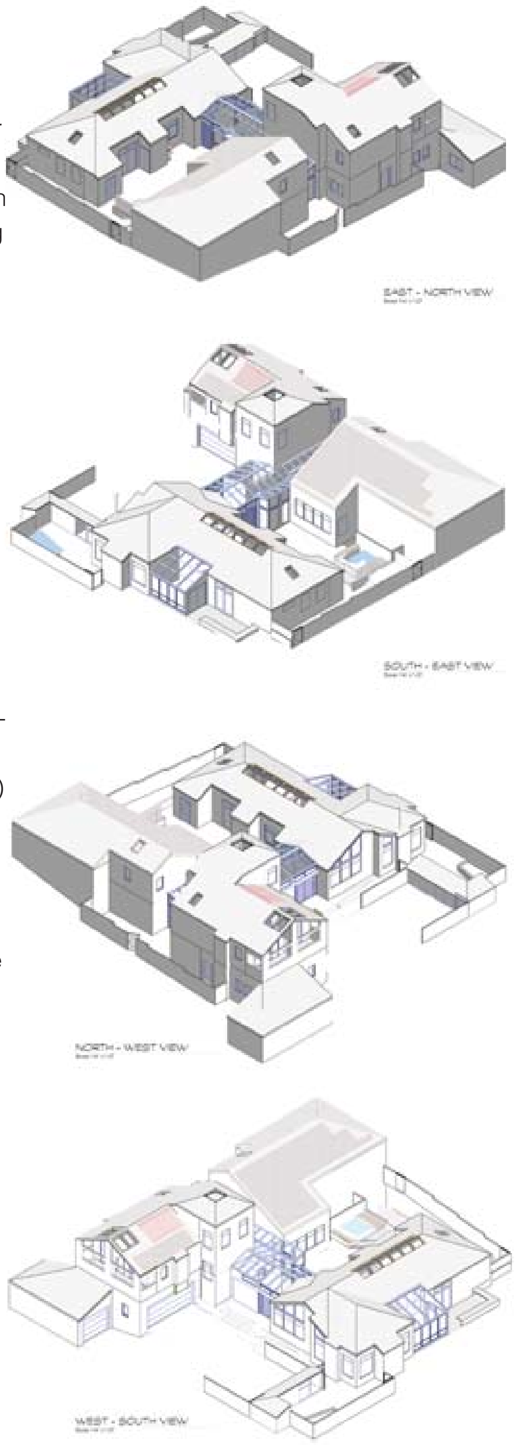
pollution and contamination from poorly designed or failing septic systems, and general land-use patterns that conserve and protect water resources within the overall ecosystem at The Sea Ranch. The water-efficient site plan and drainage design promotes "smart water use." And the overall design of the home will further cut its energy use with efficiency, and then meet the remaining needs with renewable energy sources.

Passive Solar Design

An important design element is the provision of daylighting, so that during daylight hours sunlight is the source of light instead of electric lighting. This can be accomplished with windows; doors; and traditional, specialized, and tubular skylights.

The design and implementation of these solutions are critically important to the successful passive solar performance of the Optimum Performance Home. The use of low-emissivity (low-E) window coatings combined with argon gas-filled glass in double- and triple-pane windows, as well as special glazings that result in little solar heat gain, are effective tools to employ to optimize passive solar design, otherwise known as a direct-gain system. The benefit sought with a direct-gain system is to optimize heat gain with sunlight during the day to warm spaces.

The foundations are high-mass six-inch-thick concrete slabs, and the interior walls are plaster-treated, which facilitate absorption of the heat into the floors and walls, which is released later throughout the evening to keep the home warm at night. Thus, heat retention should not be a problem with the home. Climate along the Pacific Ocean Sonoma County coastline at The Sea Ranch is mild, with lows typically not below 40 degrees and highs not exceeding 80 degrees. Glazing treatments will have to be carefully applied, so as not to cause an overheated interior



Four perspective views of the Optimum Performance Home at The Sea Ranch

environment. The daily ocean breezes will serve as a temperature value, using the opening and closing of windows, doors, and skylights to moderate indoor temperatures and to provide fresh air ventilation.

Glazings that have a high solar heat gain coefficient (SHGC) generally will be desirable on windows and skylights facing south, while lower SHGC glazings will be desirable on the east and west. Hard-coat (pyrolytic) Low-E glazings provide higher SHGC values than the typical soft-coat Low-E glazings.

Biophilic Design

The Optimum Performance Home has been designed to optimize biophilic benefits, including connecting the home's occupants with nature to ensure optimum physical and psychological health. Biophilia is literally a love for nature, and it is rooted in human biology and evolution, thus supporting the argument for conserving nature. Exposure to nature produces positive outcomes on human health and healing, and significantly contributes to stress reduction. The biophilic design features of the home are intended to inspire interest in—and appreciation of—nature by all occupants, especially children, which in our case will be grandchildren and great grandchildren. Efforts have been made to put the home's occupants in closer contact with nature through the design of the three-building compound, landscape design, and interior design. (Please reference Julie Stewart-Pollack's articles entitled "Biophilic Design," which appeared in Issue 3, May/June 2006 and Issue 4, July/August 2006.)

The glazing design contributes to three biophilic attributes: dynamic natural light (rhythmical living light, patterns of brightness and shadow, sparkle), natural ventilation (movement of air, changes in air temperature, airborne scents), and prospect and refuge

(strategic viewing conditions from a position of safety and security).

The home's design encourages occupants to explore, discover, and learn from the complexities of nature. Extensive open, naturalized, and planted space surrounds the three-building compound to put occupants in closer touch with nature. Numerous windows and doors invite occupants to look out over the surrounding environment, including plants and water elements. The courtyard, green roof garden terrace, garden, balconies, and front porch entry extend the home's living and working spaces, exposing occupants to the aroma of the outdoors, including the smells of wildflowers in the spring and summer; temperature fluctuations; and the feel of nature along the Pacific Ocean coastline, Gualala River, and gently fringed Redwoods.

Natural Daylighting

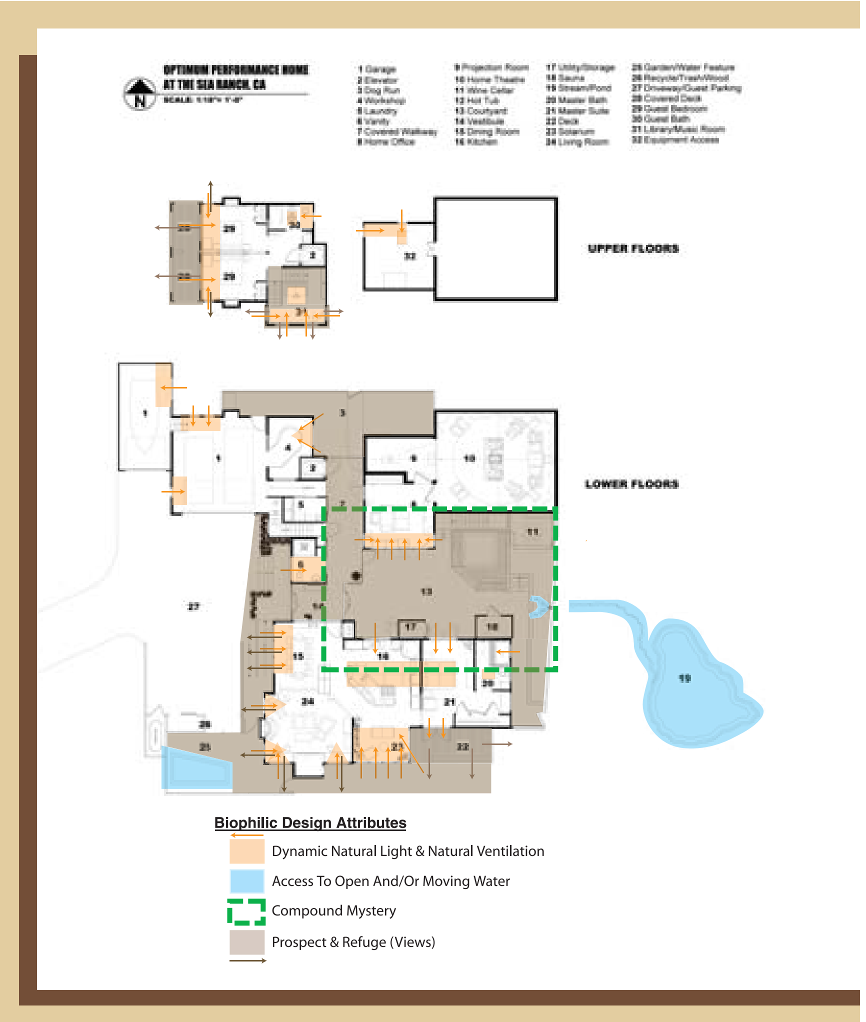
The overall approach to the space design of the Optimum Performance Home was to consider occupant space needs and design from the interior out. Thus, the design of room configurations was done in conjunction with daylighting opportunities. This took into account window, vision glass door, and skylight locations, and the arrangement of furniture and internal spaces within rooms. Thus, the design adheres to the idea of "human scale" sizing and the concept of a "not-so-big house," extensively advocated in books authored by architect Sarah Susanka and others.

Significant daylighting is provided with the placement of windows in the dining room and living room; the ridge skylight, which traverses the kitchen and the master bedroom suite; and the solarium, which floods the kitchen with daylight. Further, the French door locations in the master bedroom suite are opposite each other to facilitate excellent daylighting and fresh air ventilation. The master bath is supplied with daylighting with an operable skylight and window. Daylighting for the home office is facilitated by a wrap-around array of casement windows, with prominent exposure to the south. Each guest bedroom features sliding French doors and casement windows, which can provide fresh air ventilation as well as abundant daylighting. The guest bathroom features an operable skylight and a window for fresh air ventilation and daylighting. The library/home theatre/surround music room features daylighting and cross ventilation through casement windows and a pyramid skylight for daylighting.

The design element, which integrates the three-building compound into a holistic entity, is the glass-enclosed vestibule and walkway that provides exceptional daylighting and fresh air ventilation. And the guest vanity features an all-glass roof with an operable skylight and high casement windows facing west. As for the underground wine cellar, a tubular skylight will be fitted to the cellar's thick concrete ceiling, using a large-diameter reflective tube to bring in daylighting from the outside green roof garden terrace above.

This design approach ensures that during the daylight hours no additional electrical lighting will be necessary, thus optimizing the energy efficiency of the home and reducing energy consumption, as well as providing optimum physical and psychological health for the home's occupants. This design contributes to the home's ability to maintain critical life-support conditions in the event of extended loss of power.

Thus, the Optimum Performance Home is a full-blown passive solar design with the glazing area, air circulation patterns, and use of thermal-storage materials carefully planned to harness sunlight to provide daylighting and controlled heat, and to channel breezes off the Pacific Ocean to provide fresh air ventilation.



Pella® Designer Series® Windows And Doors

Not only are windows and doors functional and aesthetic elements of any home, they also can infuse a home with beautiful, natural light.

Since 1925, Pella® Windows and Doors have been known for quality craftsmanship and innovation. The company currently holds 57 product and design patents.

An important factor in the selection of Pella Windows and Doors for the Optimum Performance Home was Pella's commitment to purchasing wood from timber companies that practice responsible reforestation methods and utilizing manufacturing methods that minimize waste. Pella takes a comprehensive approach to environmental stewardship that maximizes recycling opportunities, reduces energy consumption, uses the latest in waste management strategies, and ensures that Pella products are made to last.

As a founding member of the National Fenestration Rating Council (NFRC) and volunteer partner in the Department of Energy's ENERGY STAR® program, Pella manufactures and promotes the use of highly energy-efficient products.

This translates to:

- About 80 percent of suppliers being third-party certified
- About 99 percent recycled or reused sawdust
- 95 percent recycled aluminum use in aluminum sash cladding
- 20 percent recycled glass use—the maximum recycled content, which still provides desired visual clarity

Overall, most Pella products have at least 20 percent recycled content.

Pella is also a member of the U.S. Green Building Council and offers products that contribute to recognition in the LEED for Homes program.

Pella quality extends to natural wood-frame interiors, which can be painted or stained to match a home's wood floors, ceilings, cabinetry, furniture, interior doors, and trim. Their wood frames provide a high insulating value, which will enhance the comfort of occupants who get next to a window, even on the coldest—or hottest—of days. In the case of the Optimum Performance Home, these features were critical elements in the home's interior. The wood interior frames of Pella products will be stained to match the rich environmentally friendly Kahrs® Pineau Oak hardwood floors and the warm matching solid and veneer Oak hardwood cabinetry in the home.

Pella® Windows And Doors

- Pella Windows and Doors have been known for quality craftsmanship and innovation. Their EnduraClad® Plus and Seacoast Exterior Paint finishes ensure superior weatherability and longer lasting protection against chalking, fading, corroding, and exposure to the sun's UV rays. Pella quality extends to natural wood-framed interiors, which can be painted or stained to match a home's interior décor.

Pella windows and doors are available with low-maintenance exterior aluminum cladding for added convenience and protection from the elements. In the Optimum Performance Home, brown aluminum-clad exterior frames have been chosen with the additional protection of Pella EnduraClad® Plus finish. This finish is made with full 70 percent Kynar 500®2 resin, which ensures superior weatherability and longer-lasting protection against chalking, fading, corroding, and exposure to the sun's UV rays. Sash corners are joined three ways for superior strength using special metal fasteners, and to protect against salt air, high winds, driving rain, fog, and humidity—elements of The Sea Ranch environment. To help weather the harsh coastal environment, Pella offers an optional Seacoast Exterior Paint Finish to provide even greater performance over time.

Pella Designer Series windows and patio doors have been selected for the home. The Pella Designer Series windows and doors uniquely feature exclusive between-the-glass window fashions, with a selection of colorful blinds, shades, and grilles tucked neatly between panes of glass—protected from dust and damage. Various options will be installed, including virtually transparent Vivid View® screens, which allow more light and more air into the home; cordless raise-and-lower between-the-glass blinds or fabric-pleated shades, including blackout shades; removable beveled wood grilles; and self-storing Rolscreen® retractable insect screens. Pella Designer Series windows and patio doors featuring triple-pane glass are number one for energy efficiency among top national brands (Superior NARC U-values and SHGC ratings).

The variety of window styles will include awning, casement, custom trapezoid, and custom triangle. The Pella Designer Series patio doors will include double and single French, sliding French, and custom doors with snap-in, snap-out decorative glass panels.

U-values of Pella products are impressively low. U-value measures a window's ability to resist the transfer of heat. Pella low-E glass coatings help reduce heat transfer through the glass. Pella windows also reduce UV rays, as well as other light, that can fade or

Rocky Mountain Hardware

• Rocky Mountain Hardware is the finest-quality hardware available to homeowners today. Handcrafted for exceptional beauty and durability, each piece is cast in solid bronze and is available in a diverse palette of rich patina finishes applied by hand—without using powder coatings, paints, or lacquers.

VELUX® Skylights And Roof Windows

• VELUX® is the only manufacturer with all standard skylights meeting ENERGY STAR approval guidelines for all climatic regions of the U.S. VELUX remote-controlled venting electric skylights (Model VSE) are the ultimate skylight for natural daylighting, controlled fresh air ventilation, and eliminating condensation. VELUX also manufactures both a flexible and rigid Sun Tunnel™.

darken carpets, walls, and furniture. The low-E InsulShield® insulating glass selected for the home is energy-saving argon gas-filled. The application of triple-pane windows will further reduce outside noise by up to 80 percent for an extremely quiet interior environment.

Pella patented features include the SureLock® System and Unison Lock System for securing both the upper and lower locks with a single easy-to-use handle, integrated crank with fold-away handle, and a superior hinge design to ensure years of dependable performance. Pella's unique three-point locking system secures doors at the head, jamb, and sill for superior security. Pella French sliding patio doors are constructed with the sliding panel on the outside, so when wind blows against the door, it creates a tighter seal. Custom Pella low-E premium double French Endura Clad Plus patio doors will be installed at the vestibule and courtyard entrances, and two single French doors in the walkway, one to access the courtyard and the other the dog run. Two double French doors will be installed in the master bedroom suite. There will be a Pella double French sliding patio door installed at each guest bedroom location for access to the guest quarters' deck.

Pella offers, as an option, Rocky Mountain Hardware, the finest-quality hardware available to homeowners today. Handcrafted for exceptional beauty and durability, each piece is cast in solid bronze and is available in a diverse palette of rich patina finishes applied by hand—without using powder coatings, paints, or lacquers. Rocky Mountain Hardware will be installed on the collection of Pella windows and doors in the Optimum Performance Home.

VELUX® Skylights And Roof Windows

Over the past 60 years, VELUX® has been a world leader in the manufacturing of skylights and roof windows, and they hold more than 300 patents in roof window and skylight design. VELUX is the only manufacturer with all standard skylights meeting ENERGY STAR approval guidelines for all climatic regions of the U.S.

Skylights and roof windows will help connect the home's occupants with nature to ensure optimum physical and psychological health. In application, they provide abundant daylight while visually expanding rooms in any style or size home. They also provide the aesthetic benefits of balanced natural light. And skylights and roof windows help to address other light-related health considerations, particularly for older adults. Researchers report that to accommodate the adaptation of the aging eye, the amount of light required for visual acuity doubles for each 13 years after the age of 20. More natural light equals better sight. Skylights and roof windows also will enhance the ability of the home's occupants to perform significantly better, whether preparing meals, reading, or doing productive work, in an environment that is lit with overhead natural light rather than artificial light.

Kitchens are especially prone to the effects of poor ventilation with large amounts of hot, humid air that is generated during cooking. Without natural light and ventilation, kitchens become dark, stuffy, airless spaces in which stale odors and heavy, humid air linger. A custom VELUX ridge skylight is designed to bridge the cathedral ceiling above the kitchen and master bedroom suite.

For more information on this advertiser, circle 12

One panel in both the kitchen and master bedroom suite ridge skylight assembly will be a VELUX remote-controlled venting electric skylight (Model VSE) to provide fresh air ventilation.

All three bathrooms in the Optimum Performance Home will feature a VELUX remote-controlled venting electric skylight to provide natural daylighting and fresh air ventilation, and eliminate condensation. Their placement is designed to optimize ventilation and eliminate excess moisture—mold, mildew, and decay. With natural light from above, privacy is assured, plus there will be more wall space for storage or decorating (where windows would otherwise be).

A VSE skylight also will be installed in the boat garage and in the storage room over the dedicated home theatre's rear-projection room to provide natural daylighting and fresh air ventilation.

VSE venting electric skylights open and close quickly and quietly from anywhere in a room. The remote is a slimline design and can function to operate multiple skylights and sunscreening blinds. It is also programmable to close VSEs after a set time period. Additionally, rain sensors automatically close skylights during inclement weather.

VELUX also manufactures both a flexible and rigid Sun Tunnel™. A Sun Tunnel will be installed on the green roof garden terrace, extending down through the wine cellar concrete ceiling. The highly reflective, durably bonded interior coating will provide natural daylighting to this room without windows. The optional lighting kit will allow the Sun Tunnel to be a source of illumination at night. The exposed exterior dome features an unobtrusive low-profile design.

A specially designed VELUX pyramid skylight will be installed in the library/home theatre/surround music room.

VELUX's other impressive features include:

• Exterior Heat Control—The best protection for heat gain is an exterior HeatBlock™ awning that stops the heat before it hits the glass and penetrates the room.

• Weathertight Flashings—Prefabricated leakproof VELUX flashing system.

• Comfort Glazing—Standard on all VELUX skylights and roof windows to provide comfort on hot summer days and on cold winter nights.

• Interior Light Control—A huge assortment of blinds and shades are available to diffuse, adjust, or block out the light.

Sage Electrochromics, Inc.

• SageGlass® is an electronically tintable exterior glazing that provides glare control on demand, while preserving views. SageGlass is a multi-layer, thin-film tungsten-oxide coating that is as durable as low-emissivity coatings and does not degrade with exposure to UV light.

Lindal SunRooms

• Lindal sunrooms are built with the same high-quality materials as all Lindal Cedar Homes. A Lindal sunroom is engineered to provide a lifetime of trouble-free living. The sunrooms combine kiln-dried premium-grade Western red cedar with energy-efficient windows of the highest industry rating for their ability to prevent air and water infiltration under the toughest test conditions.

• Convenient Controls—Electric infrared remote-controlled systems.

Rather than using plastic, VELUX skylights and roof windows exclusively use glass, which is more energy-efficient and more durable. Glass reduces external noise and won't discolor, leak, or allow drafts.

In the Optimum Performance Home, VELUX ComfortPlus™ glass will be used exclusively. This employs double-pane laminated glass construction with argon gas between low-E coated panes. This design will provide maximum protection from both heat gain and fading by controlling up to 83 percent of the sun's fade-causing rays. Also available is Electrochromic glass for select VSE sizes. The SageGlass® electrochromic layer allows glass to switch between a clear state and a dark state, making the glass electronically tinted. SageGlass is a multi-layer, thin-film tungsten-oxide coating that is as durable as low-emissivity coatings and does not degrade with exposure to UV light.

Additionally, skylights can be equipped with a Cellular shade, LightBlock™ shade, and/or a charcoal net cloth HeatBlock awning. The Cellular shade diffuses the light and increases energy efficiency up to 16 percent. The LightBlock shade is perfect for room darkening and for increasing energy efficiency up to 20 percent. Electric controls raise or lower the shade at the touch of a button. Other options include thermally coated pleated shades to diffuse the light and reduce UV fading, and to increase energy efficiency up to 12 percent. The thermally coated aluminum Venetian blind option provides optimal glare and light control to direct the light where desirable. This option also increases energy efficiency up to 12 percent.

The VELUX warranty covers 20 years on insulated glass seals, 10 years on the skylight, roof window, or Sun Tunnel, and five years on blinds, controls, and electronics.

Vestibule, Walkway, And Solarium

Lindal SunRooms, a division of Lindal Cedar Homes, will fabricate the custom design for the vestibule, walkway, and solarium in the Optimum Performance Home. Founded in 1945, Lindal Cedar Homes has over 60 years of commitment to being one of the home building industry's leaders in quality building materials, design, and engineering.

Homeowners who decide to include a Lindal sunroom savor the untold light and luxury it brings to their homes. Lindal sunrooms are built with the same high-quality materials as all Lindal homes.

Like a Lindal Cedar Home, a Lindal sunroom is engineered to provide a lifetime of trouble-free living. The sunrooms combine kiln-dried premium-grade Western red cedar with energy-efficient windows of the highest industry rating for their ability to prevent air and water infiltration under the toughest test conditions. Made with state-of-the-art low-E argon-filled glass, the windows provide comfort, energy efficiency, and reduce fading of draperies and furniture fabrics. To best capture views, Lindal sunrooms include a hidden connector system, allowing large expanses of glass, uninterrupted by bulky exposed hardware. And the engineering strength of Lindal sunrooms meets or exceeds local building codes.

Engineered for a lifetime of trouble-free living, Lindal sunrooms feature:

• Patented Hidden Connector System—Each Lindal sunroom supports expanses of glass for uninterrupted views. The main framing members of the sunroom are constructed of clear, select, solid kiln-dried Western red cedar. On a post and beam room, the framing members are architectural-grade, horizontal, glue-laminated posts and beams.

• The Right Glazing Options—Lindal continually monitors the latest window glazing technologies for advances that stand the test of time. Thermal glass with a special low-E coating provides greater comfort and lower energy costs. A state-of-the-art glazing system bridges the glass panels and provides an airtight and watertight seal. Lindal dealers are trained to determine the correct specification and right amount of overhead glass that will work best for a specific situation.

The engineering for the vestibule, walkway, and solarium is designed to make the most of the site's exceptional views, light, and climate, while offering year-round comfort and livability. The structures are engineered and designed so that the moisture and condensation will escape and drain to the exterior. The drain design (on both the vertical glass and sloped glass) is critical for moisture and humidity to exit the spaces. Otherwise, within a short time, the wood-framing members will start to rot, and the insulated glass seals will fail. The interior FSC-certified wood will be finished to match the rich environmentally friendly Kährs Pineau Oak hardwood floors and the warm matching solid and veneer Oak hardwood cabinetry throughout the home. The exterior of the frame structure will consist of anodized aluminum, finished in the same brown hue as the Pella Window and Door exterior EnduraClad Plus aluminum-clad exterior frame finish.

Lindal High Performance vertical glazing carries a lifetime warranty, and the structure and horizontal glazing are warranted for 10 years.

Flooring

The design of the Optimum Performance Home incorporates both solid-surface flooring (hardwood, slate, tile, and polished concrete) and all-natural wool carpeting.

Solid-surface flooring is an excellent choice from an indoor air-quality standpoint. Slate flooring will be used at the entranceways to the home to minimize tracked-in contaminants and moisture. The slate flooring further serves as a design element to integrate the three-building compound. At the entryway, slate will be introduced as the primary flooring surface, both on the stairs, the ramp way, and the porch. As one enters the vestibule, the slate flooring will continue down the walkway and through to the courtyard. The entire courtyard will be surfaced with slate. As one enters the main residence, the slate surface will establish a main-use path separating the dining room, living room, and the kitchen, and serve as the flooring for the solarium. The kitchen will be surfaced with slate.

Hardwood flooring will be used for the dining room, and wool carpeting will be used for the living room, master bedroom suite, guest bedrooms, and the dedicated Optimum Performance Home Theatre and rear-projection room. The flooring for the master bathroom will be tile. Wool or cotton area rugs will be selectively positioned on the slate flooring and the hardwood floors, where a softer surface is desired.

Slate and non-slip tile are excellent surfaces for universal design applications, as they can provide a solid traction surface to help prevent a potential accidental trip or fall, and provide for easy wheelchair mobility should that ever be required. Noteworthy is that all surfaces will be perfectly level with each other. This is an important aspect of the home's universal design floor plan that eliminates any challenging physical barriers, such as steps, humps, bumps, edges, and uneven surfaces. Where steps are required at the home's entrance, a ramp is also provided as an alternative approach. The second story guest quarters and library/home theatre/surround music room are accessible by either stairs or a residential elevator. These stairs will be surfaced with hardwood. Both the interior stairs and the exterior entrance stairs will feature undernose low-energy use, 12-volt-powered diffuse amber light delineating each step for safety.

Kährs Hardwood Flooring

A mandatory requirement in the design of the Optimum Performance Home is for all wood used in the construction and finishing of the home to be certified by the Forest Stewardship Council (FSC). The sustainable forestry standards established by the FSC ensures that wood products come from well-managed forests, which are FSC-certified by independent, third-party organizations. Wood products derived from certified forest operations display certification stamps. (Please reference "Rainforest Alliance: Guide To Green Building Wood Sources," which was published in Issue 02, March/April 2006.)

Kährs is one of the oldest manufacturers of hardwood flooring, with a 150-year history. Based in Sweden, Kährs is one of the most innovative manufacturers of wood floors. Today, the Kährs Group is the largest wood-flooring manufacturer in Europe and one of the world's most modern industrial wood-processing companies.

In 1941, Gustaf Kähr invented the modern wood floor. Kähr owns the patent for the multi-layer engineered wood floor construction that today is the standard used in manufacturing all over the world. Engineered construction makes the floor stable, and the raw material can be utilized with greater environmental awareness. Kährs has been manufacturing quality multi-layered wood floors for more than 60 years.

Kährs Haywood Flooring

• Kährs is one of the oldest manufacturers of hardwood flooring with a 150-year history. The Kährs Woodloc® system, introduced in 2000, is the first glueless joint system in the world, which ensures perfect and fast installation, and resistance to subsequent damage. Kährs floors contain few chemical compounds and virtually no harmful chemical emissions, and meet all world formaldehyde emissions regulations.

Nature's Acoustics

• Whisper Wool™ is a floor underlay made from 100 percent sheep wool for laminate, engineered, and hardwood floors. It makes laminates sound deeper in tone, duplicating a more wood-like sound. Whisper Wool also prevents sound transmission through floors and walls. It also helps prevent squeaks in hardwood floors, thus making hardwood floors quieter than ever.

The Kährs Woodloc® system, introduced in 2000, is the first glueless joint system in the world, which ensures perfect and fast installation, and resistance to subsequent damage. The boards lock together mechanically with virtually invisible joints. This advanced and durable interlocking system tightens the joint as it installs and then locks the board in place. This ensures that gaps are minimized throughout the installation and for the lifetime of the floor.

For more information on this advertiser, circle 13

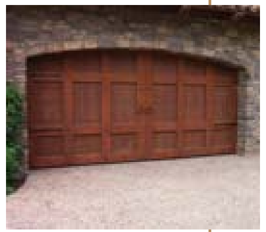
Evergreen Natural Stone Slate Flooring

• Fine natural Vermont slate from the Evergreen Slate Company, Inc. is of dense, sound rock, exceedingly tough and durable. It is also fire and waterproof and resistant to climatic changes, with absolutely no disintegration. Evergreen slate has the highest designation for durability in excess of 75 years.

Earth Weave Carpet Mills, Inc.

• Broadloom Bio-Floor sustainable carpet is made with 100 percent undyed naturally pigmented wool fibers and yarn with no synthetic glues, no moth proofing, and no stain protections or chemicals of any type, which assures that the carpet will not affect indoor air quality through off-gassing of volatile organic compounds (VOC).

Carriage House Garage And Barn Doors



• The Carriage House Door Company has crafted thousands of exquisitely designed overhead garage doors for discriminating customers across America. Every door in their Carriage House Collection offers the timeless beauty, authenticity, and quality of doors constructed a century ago, yet they have completely modern functioning.

Kährs floors contain few chemical compounds and virtually no harmful chemical emissions, and meet all world formaldehyde emissions regulations.

Kährs floors come in three varieties—1-strip, 2-strip, and 3-strip. Throughout the Optimum Performance Home, Kährs 1-strip hardwood flooring will be applied. Thus, the part of the board that you see and walk on, i.e., the wear layer, is sawn in one piece. Structurally, Kährs uses three-layer construction for a floor with minimal seasonal movements. The Kährs product range includes floors that can be installed by floating, nail-down (tongue-and-groove), and glue-down methods. Only float-in installations are acceptable for radiant heat subfloors, which is the case with the home's Uponor radiant floor-heating system. Through engineering, Kährs floors achieve the right balance between the different layers in each board—wear, core, and backing—and also the right dimension for each layer to ensure the perfect balance between the layers. And Kährs' method of woodcutting, known as plain sawn, is the same technique used for traditional 3/4-inch solid wood floors. The result is a much finer, more traditional wood grain that eliminates the splitting associated with peeled veneers. Furthermore, Kährs floors take full advantage of the entire wear layer on each plank. Kährs' 1/8-inch plain-sawn wear layer is fully compatible in thickness to a solid 3/4-inch strip floor wear layer. This is because sanding is only possible down to the tongue-and-groove in solid 3/4-inch floors. Kährs guarantees that the solid top layer can be professionally sanded and refinished at least twice during its lifetime. A wide range of Kährs moldings and accessories—bases, T-moldings, reducers, slim bases, stair noses, and shoe moldings—are available to provide the finishing touch. Due to the exceptional quality and superb engineered construction, Kährs offers a 25-year wear-through warranty.

Kährs Pineau five-inch-wide wire-brushed Oak boards will be used in the Optimum Performance Home in the dining room, the staircase up through to the second-floor guest quarters hall, the library/home theatre/surround music room, and the home office.

A small amount of extremely durable UV-cured acrylic silk matte finish will be factory-applied to protect the wood, which will allow the natural beauty of the wood grain to be revealed. The finish resists most common household stains for up to 24 hours, and the finish will not yellow over time like conventional polyurethane finish.

The medium dark Kährs Pineau Oak is a style in the company's Castle & Cottage Collection, offering the authentic charm of classically refined traditional patterns. This will give a lot of wood feeling with all the natural characteristics of the wood exposed.

Whisper Wool™ Flooring Underlay

Nature's Acoustics is a floor underlay made from 100 percent sheep wool for laminate, engineered, and hardwood floors. It makes laminates sound deeper in tone, duplicating a more wood-like sound. Whisper Wool also prevents sound transmission through floors and walls. It also helps prevent squeaks in hardwood floors, thus making hardwood floors quieter than ever.

A moisture barrier is laminated to Whisper Wool to prevent condensation from contacting the installed flooring. Even under humid conditions, Whisper Wool is mold-proof. Antimicrobial treatment prevents mold, fungus, and bacteria growth if airborne spores are present.

Multi-part wool fiber is extremely resilient, long lasting, and will not break down. Wool also absorbs sound energy and mechanical impact energy, and provides thermal insulation. And wool fibers will not support combustion.

Whisper Wool will be installed under the Kährs Pineau Oak flooring throughout the Optimum Performance Home.

Evergreen Natural Stone Slate Flooring

As previously noted, slate flooring will serve as a design element to integrate the three-building compound. Slate surfaces will extend from the home's entrance through the vestibule and walkway, and to the outside through the courtyard area. Slate will also serve as a main use path separating the dining room, living room, and the kitchen, and serve as the flooring for the solarium and the kitchen.

The slate will be comprised of fine natural Vermont slate from the Evergreen Slate Company, Inc., the largest producer and supplier of slate in the U.S. Evergreen's 11 natural slate colors and textures afford many architectural effects, contributing to a building's appearance. Slate quarried for roofing and exterior surface stock is of dense, sound rock, exceedingly tough and durable. It is also fireproof and waterproof and resistant to climatic changes, with absolutely no disintegration. Evergreen slate has the highest designation for durability, in excess of 75 years.

The flooring slate will be Variegated Purple, a rich, unusually consistent textured natural slate. The roof slate will be Evergreen Welsh Black, a rich, textured black natural slate.

Earth Weave Bio-Floor™ Collection Wool Broadloom Carpeting

Wall-to-wall synthetic or standard wool carpeting, while highly desirable as a surface in living rooms and bedrooms, has been known to have drawbacks because carpeting can be a significant source of indoor air pollution. Homeowners should be aware that synthetic carpeting off-gasses VOCs (volatile organic compounds) from the carpet itself, from the carpet pad, and from the adhesives used to glue it to the subfloor. In recent years, carpet manufacturers have attempted to address this adverse health condition, and the Carpet and Rug Institute (CRI) has established a testing and labeling program setting limits on VOC and formaldehyde emissions from carpeting. Carpeting with a Green Label Plus label offers a higher standard of indoor air quality. Unfortunately, the tested levels are not stringent enough to ensure healthy air within your home, as these carpets still contain almost 300 different chemicals.

In applications in a home—near entrances—pollutants, such as biological contaminants and toxins, can be tracked in from the outdoors and can become trapped in carpet, causing an unhealthy interior environment. A good preventative application is to install durable, removable

For more information on this advertiser, circle 14

New Century Coatings

• AgriStain's Soycrete for Fiber Cement uses soy ester technology, with better adhesion to concrete. The available hues mirror wood siding, and AgriStain can be applied direct to unprimed or primed fiber cement.

American Clay Earth Plaster

• American Clay Earth Plaster is a natural finish made from a unique combination of clays, aggregates, and natural pigments. American Clay Earth Plaster is nature's own substitute for cement, gypsum, acrylic, or lime plaster. This is the original earth plaster and is 100 percent natural, non-toxic, VOC-free, mole-resistant, moisture-controlling, non-fading, non-flammable, sound-absorbing, humidity-buffering, easy to use, sprayable, and easy to repair.

AFM Safecoat®

• AFM Safecoats are made with unique formulas that eliminate the aromatic solvents, heavy metals, and formaldehyde preservatives found in the typical paint or sealer. The result is a non-polluting coating that also acts as a sealer to help reduce off-gassing from the surface below.

Armstrong® WoodWorks Linear Ceilings

• Armstrong® WoodWorks Linear plank ceilings are available in nominal 4 1/2-inch and 6-inch modules, including 3/4-inch classic open reveal style with concealed clip system. The board planks are available in rich, natural wood veneers, with edge banding for superior quality and aesthetics.

mats at entryways to the home, to capture moisture and contaminants that would otherwise be tracked into the home. The design of the Optimum Performance Home has the garage, vestibule, and walkway serving as "mud-room" transitions before the actual entrance to the living spaces in the home. This design will minimize tracking moisture and contaminants into the home.

While natural-fiber carpets consisting of wool, cotton, and other textile fibers have low off-gassing, they still contain chemicals that are not desirable from an indoor air-quality standpoint. These chemicals are found in the adhesive used during backing, the dyes used in coloration, stain-protective treatments, and highly toxic pesticides/fungicides.

These conditions are not the case with the wool Bio-Floor™ Collection from Earth Weave Carpet Mills, Inc. The company manufactures the purest carpet available and is the only truly natural and sustainable carpet produced in North America. Bio-Floor is made with 100 percent undyed naturally pigmented wool fibers and yarn with no synthetic glues, no moth proofing, and no stain protections or chemicals of any type. The undyed naturally pigmented wool fibers and vegetable-dyed wool yarns are tufted into a cotton/hemp primary backing. The secondary backing is constructed using jute (a hardy earth-friendly fiber-producing plant) and is adhered with a natural rubber adhesive from the rubber tree. The complete absence of chemicals assures that the carpet will not affect indoor air quality through off-gassing of volatile organic compounds. And the carpet is completely biodegradable, so you have peace of mind that after its long useful life, it will return to the Earth from which it came. This is true sustainability and what a "green eco" carpet should be.

Untreated and undyed wool is the superior fiber choice for woven and tufted carpets. It is non-toxic, non-allergenic, and will not support bacterial growth. The high-moisture content of wool reduces static electricity and the risk of shocks. The fibers themselves help to regulate moisture in the air and actually take on moisture, as well as give off moisture as the environment changes humidity. This is what allows wool to be cool in the summer and warm in the winter.

Wool carpet also purifies indoor air of common contaminants like formaldehyde, nitrogen dioxide, and sulfur dioxide by locking contaminants deep in the core of the fiber. Wool carpets continually purify indoor air for up to 30 years. Another benefit of wool's naturally crimped shape is the formation of millions of air pockets that act as insulation to help regulate room temperature and reduce energy bills and absorb sound. Wool's high-moisture content and protein constituents make it naturally flame retardant. And wool carpets have other natural properties, such as resilience, resistance to 80 percent of all stains, and natural resistance to soil and dirt.

The Bio-Floor Collection is available in a variety of natural hues. As stated in Part VII, the hue for the home theatre and rear-projection room flooring will be a custom-dyed, Earth Weave irregular-looped, 44-ounce black Berber with all-natural 7/16-inch thick Enertia™ wool padding laid over the concrete floor surface. The living room and the three bedrooms in the home will be surfaced with irregular-looped 44-ounce Berber with all-natural 7/16-inch thick Enertia wool padding laid over the concrete floor surface. Unlike the required dyed carpet in

DESIGN
optimum performance home

the home theatre and rear-projection room, this carpet will be undyed, with naturally pigmented wool fiber hues manufactured by Earth Weave.

YOLO Colorhouse

• YOLO Colorhouse is a collection of environmentally responsible, nature-based, premium interior paints. YOLO Colorhouse paints contain zero volatile organic compounds and are durable and washable. The Earth Color Collection reflects the purity of Earth's color palette with a line of 43 warm, earth-based hues.

Ceilings

Armstrong WoodWorks Linear Ceilings

The ceilings in the main house (Building One) will be surfaced with Armstrong WoodWorks Linear, as well as the guest bedrooms and library/home theatre/surround music room (Building Two) and the home office (Building Three). WoodWorks Linear plank ceilings are available in nominal 4 1/2-inch and 6-inch modules, including the 3/4-inch classic open reveal style with concealed clip system. The board planks are available in rich, natural wood veneers, with edge banding for superior quality and aesthetics. The veneer will be white oak and stained to match the Kährs hardwood flooring.

Garage And Barn Doors

Carriage House Garage And Barn Doors

The Carriage House Door Company has crafted thousands of exquisitely designed overhead garage doors for discriminating customers across America. Every door in their Carriage House Collection offers the timeless beauty, authenticity, and quality of doors constructed a century ago, yet they have completely modern functioning.

Carriage House is designing special fiber-cement doors to match the exterior look of the Optimum Performance Home and to transform our design ideas into doors of distinction that will add value to the home. All Carriage House custom garage doors complement the architecture of older homes as well as newly designed residences. Every detail, including the hardware, is chosen to fit seamlessly into the home's overall design and style.

Unlike the old doors that swung, folded, or slid open, Carriage House uses the heaviest gauge hardware available and the latest technology in automatic openers. Their exceptional workmanship ensures reliable performance and low maintenance.

For more information on this advertiser, circle 15

Advanced Floor Products, Inc.

• Advanced Floor Products' RetroPlate™ is an attractive, durable, finished concrete slab polishing process. The company has pioneered the process of grinding, polishing, and chemically hardening (densifying) concrete by combining European stone grinding and polishing technology with concrete hardening and densifying agents.

Carriage House is also designing and fabricating the three custom barn doors—one at the entrance to the home, which slides and locks off the vestibule entrance; one that serves as the door to the workshop; and one that serves as the door to the laundry room or the ramp to the garage.

The custom barn doors are being designed in perfect harmony with the home's architectural style. Exceptional workmanship, superior woods, and professional hardware are standard features on all of Carriage House custom wooden barn doors.

Polished Concrete Flooring

Advanced Floor Products, Inc. has developed RetroPlate™, an attractive, durable, finished concrete slab polishing process. The company has pioneered the process of grinding, polishing, and chemically hardening (densifying) concrete by combining European stone grinding and polishing technology with concrete hardening and densifying agents. In the process, large diamond-wheel grinders remove between 1/16- and 1/4-inch of the concrete floor surface. Consecutively, finer-grit grinding and polishing wheels achieve a fine polish (up to 3,000 grit). During the polishing process, sodium silicate is applied. This absorbs and reacts with the calcium hydroxide in the concrete to form calcium silicate hydrate, which crystallizes within the concrete matrix. The resultant concrete surface is highly durable, easy to maintain, free of VOC emissions, and more light reflective.

The garage floors in the Optimum Performance Home will be finished using the RetroPlate process.

Flooring And Siding Stains

New Century Coatings' AgriStain technology under the Soycrete for Fiber Cement brand name will be used on the fiber-cement siding manufactured by James Hardie Building Products, Inc. Fiber-cement exterior sidings are durable, attractive alternatives to traditional wood composite, redwood, cedar, vinyl, brick, or stucco sidings. AgriStain uses soy ester technology, with better adhesion to concrete. The available hues mirror wood siding, and AgriStain can be applied direct to unprimed or primed fiber cement.

Soycrete is also designed to color concrete. The key to the great performance of Soycrete is penetration. Using natural by-products of corn, sunflowers, or soybeans coupled with a water-based acrylic technology, AgriStain (Acri-Soy) for Concrete will be used to effectively penetrate and seal the concrete slabs and garage floors.

AgriStain TimberSoy for Wood is just like traditional Minwax or Ace solvent stain in application but without the smell and toxicity. That's because AgriStain TimberSoy is bio-based and cleans up with soap and water. AgriStain TimberSoy accentuates grain definition equal to all solvent stains and can be sealed with water or solvent topcoats. It can be applied without wearing gloves because it softens the skin naturally like many hand lotions. It will be applied to exterior FSC-certified IPE decking outside the master bedroom suite, the guest bedrooms, and the hot tub decking.

All AgriStain technologies are composed of renewable resources with a bio-based content >70 percent for stains and 25-35 percent bio-based content for sealers. All AgriStain technology products are <25 g/l VOC.

American Clay Earth Plaster

The interior walls and selected ceilings of the Optimum Performance Home will be finished with American Clay Earth Plaster, a natural finish made from a unique combination of clays, aggregates, and natural pigments. American Clay Earth Plaster is nature's own substitute for cement, gypsum, acrylic, or lime plaster. This is the original earth plaster and is 100 percent natural, non-toxic, VOC-free, mole-resistant, moisture-controlling, non-fading, non-flammable, sound-absorbing, humidity-buffering, easy to use, sprayable, and easy to repair. Three unique finishes and 52 lush standard colors are available, as well as unlimited custom colors. Loma is a smooth finish that creates a soft, even finish. Porcelina is super-smooth for a more polished appearance. And Marittimo features a seashell aggregate to produce a uniquely smooth, yet faceted effect—a natural sheen with additional hardness.

The Original Earth Plaster by American Clay Enterprises mechanically bonds to properly primed stable and dry substrates, including masonry, cement, stucco and plasterboards, gypsum, lime basecoat or base Earth plasters, and even painted walls.

AFM Finishes

Many of today's building materials and coatings are loaded with toxic chemicals. They contribute to the problem of indoor air pollution and chemical

sensitivity through a process of evaporation called off-gassing. This is true, even for so-called "environmental zero-VOC coatings," which can still contain toxic ingredients not prohibited by any government regulation.

For over 20 years, AFM (American Formulating and Manufacturing) Safecoat® finishing products have been helping people create healthy environments without sacrificing beauty or durability. Several non-toxic AFM paints, stains, and sealers, which perform as well or better than their toxic counterparts, will be used throughout the Optimum Performance Home, including AFM Wallboard Primecoat HPV (wallboard primer), AFM MetalCoat Metal Primer (corrosion-resistant film primer), and AFM Safecoat Paint (free of chemical additives). AFM Safecoats are made with unique formulas that eliminate the aromatic solvents, heavy metals, and formaldehyde preservatives found in the typical paint or sealer. The result is a non-polluting coating that also acts as a sealer to help reduce off-gassing from the surface below.

American Formulating and Manufacturing has received SCS Indoor Advantage™ Gold certification for its Safecoat primers and paints— Safecoat Polyureseal BP, Acrylacq, Acriglaze, Mexeseal, and Durostain.

Indoor Advantage certification is administered by SCS (Scientific Certification Systems) of Emeryville, California. The certification relies on data collected through small chamber testing, which allows manufacturers to examine a product's individual components. Indoor Advantage Gold meets USGBC LEED criteria for EQ4.5, EQ4.1, and EQ4.2, as well as standards for California 01350 and the Collaborative for High Performance Schools.

The Indoor Advantage Gold program has the added benefit of being health driven; it is based on Chronic Reference Exposure Levels set by the California Office of Environmental Health Hazard Assessment, rather than Total VOCs and Threshold Limit Values (TLVs) used by other certification organizations.

An alternative to the AgriStain for Wood stain previously referenced is AFM's Naturals Oil Stain, a slow-drying, no-sheen stain made with selected natural ingredients with excellent color properties. AFM Naturals Oil Wood Stain helps prevent grain raising and exhibits good color stability.

YOLO Colorhouse

YOLO Colorhouse is a collection of environmentally responsible, nature-based, premium interior paints. YOLO Colorhouse paints contain zero volatile organic compounds and are durable and washable.

For more information on this advertiser, circle 16

The Earth Color Collection reflects the purity of Earth's color palette with a line of 43 warm, earth-based hues. These hues are organized into seven user-friendly color groups—Leaf, Grain, Stone, Clay, Air, Water, and Petal.

YOLO Colorhouse exceeds Green Seal environmental standards for VOCs and other ingredients. Green Seal provides science-based environmental certification standards that are credible, transparent, and essential for end users to make responsible choices that positively improve quality of life.

Selected applications of YOLO Colorhouse zero VOC paint will be used throughout the Optimum Performance Home. With zero VOC content, YOLO paint does not contribute to the depletion of the Earth's ozone layer, as do other conventional latex paints made with solvents that evaporate easily at room temperature and produce poor indoor air quality.

Next

As stated in past articles in this series, the design review process itself has no doubt weighed us down over this unexpectedly long period of time—four years. But now that the Design Committee has granted final approval, the project is moving forward in a hastened manner so that commencement of construction can, hopefully, begin in late March or April 2007, subject to avoiding any serious rainstorms.

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The next series of articles will continue to focus on particular design elements and on each stage of construction, the design approach taken, and the technologies and building systems and materials used to create the first Optimum Performance Home. UHD

The Author

Gary Reber is the President of Ultimate Home Design, Inc. and the founding Editor-In-Chief and Publisher of *Ultimate Home Design*®, The Optimum Performance Design & Build Resource For Environmentally Enhanced Lifestyle Living™. He is also President of WSR Publishing, Inc, which publishes *Widescreen Review*®, The Essential Home Theatre Resource™. His diverse background in several fields includes an undergraduate, graduate, and postgraduate university education in architecture, community planning, and economic development planning. For years he was a consultant on community and economic development planning. For the past 15 years he has been an editor and publisher of magazines in the consumer electronics field. Gary can be reached at 951 676 4914 or gary@ultimatehomedesign.com.

Architectural Illustration & Photo Credits

Ronald Devesa is an architectural illustrator, based in Santa Rosa, California. He specializes in architectural rendering and CAD drafting using AutoCAD, Autodesk VIZ-Maxwell, and Photoshop. He is a member of the American Society of Architectural Illustrators. Samples of his work can be viewed at www.geocities.com/rldevesa. Ronald can be reached at 707 849 3500 or rldevesa@sbcglobal.net.

Scott Simpson is a pilot and aerial photographer. His company is West Of One, based in Gualala, California. Scott resides at The Sea Ranch and provided the aerial photos depicted in this article. Samples of his work can be viewed at www.westofone.com. Scott can be reached at 707 785 9445 or scott@westofone.com.

Product Information

- Advanced Floor Products / Retro Plate System, P.O. Box 80533, Provo, Utah 84605, 801 812 3420, www.retroplatesystem.com
- American Clay Enterprises, 2601 Karsten Court SE, Albuquerque, New Mexico 87102, 866 404 1634, www.americanclay.com
- American Formulating and Manufacturing (AFM), 3251 Third Avenue, San Diego, California 92103, 800 239 0321, www.safecoat-paint.com
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- Carriage House Door. 1421 Richards Boulevard, Sacramento, California 95814, 916 375 0575, www.carriagedoor.com
- Earth Weave Carpet Mills, Inc., P.O. Box 6120, Dalton, Georgia 30722, 706 278 8200, www.earthweave.com
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- New Century Coatings, 4320 East San Remo Avenue, Higley, Arizona 85236, 602 625 8925, www.agristain.com
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- Uponor North America, 5925 148th Street West, Apple Valley, Minnesota 55124, 800 321 4739, www.uponor-usa.com
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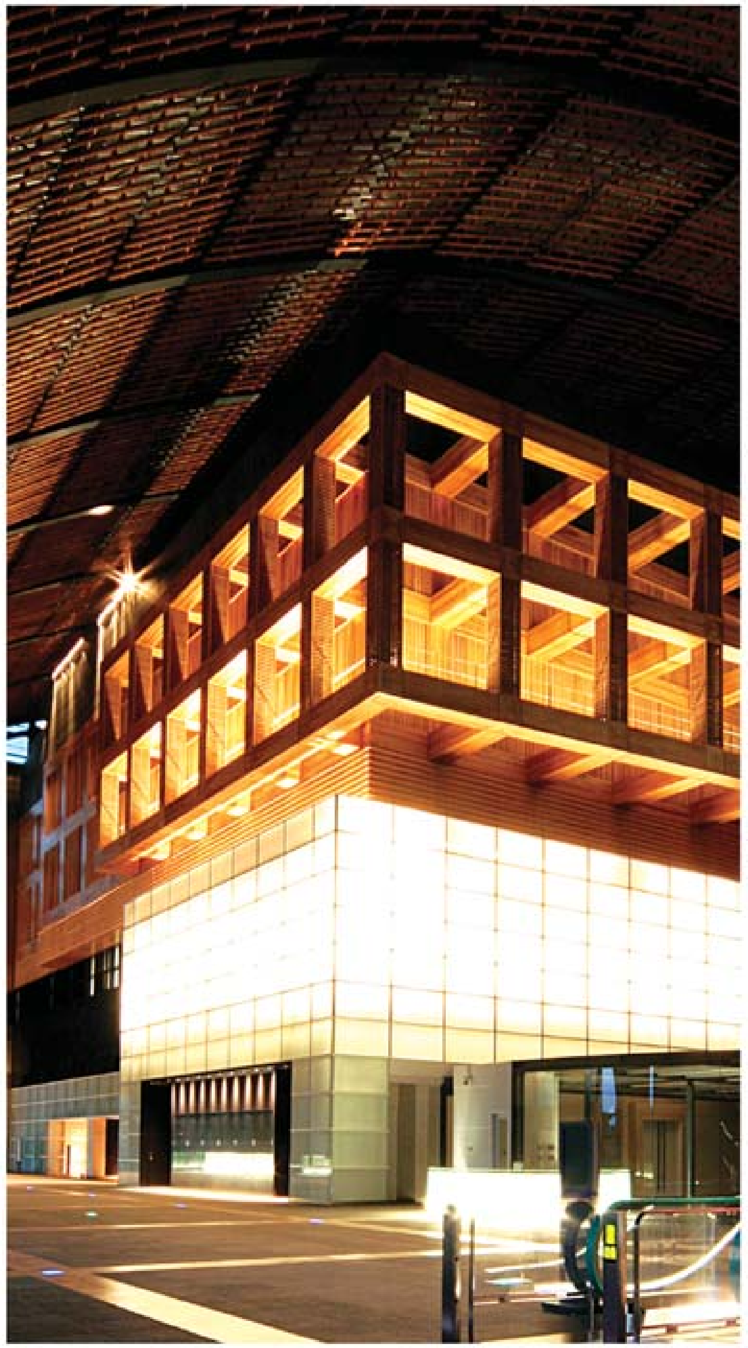

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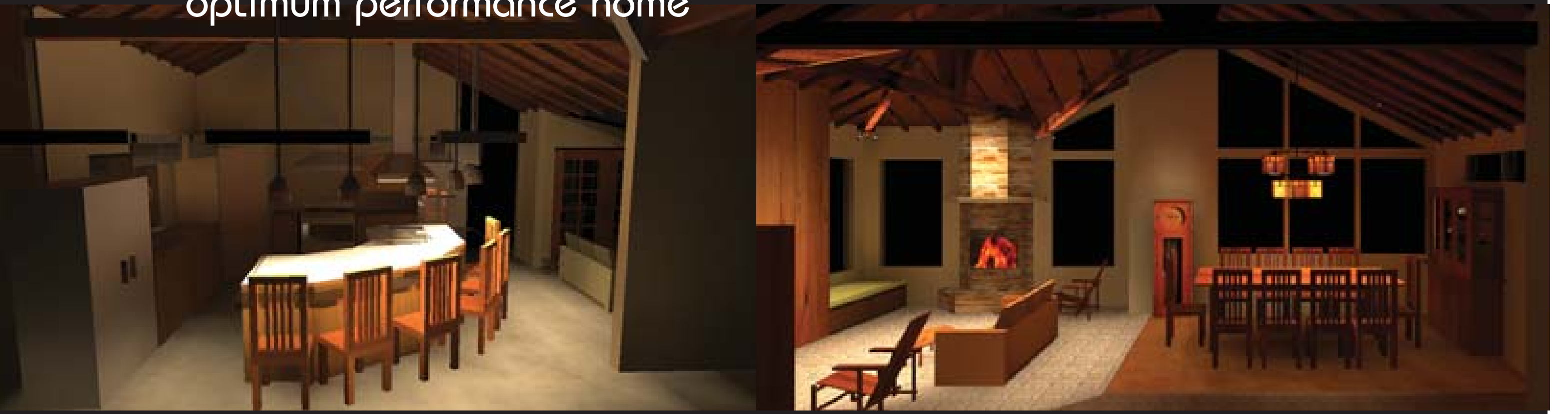


Lighting Design Process
for the first Optimum Performance Home™

Patricia Rizzo, Sandhya Parameswaran, Rui (Nancy) Qi, Robert Soler & Justin Bosy

synopsis

- Gaining an understanding of the clients' lifestyle and the vision they have for their home is foremost in beginning to assess what the lighting solutions will be.
- As lighting is more a sensory than a spatial experience, the contrast between light and dark, the transitions and shadows, whether deliberate or accidental, can stir a memory, hint at an emotion—or shout out an invitation for fun and laughter.
- There are three main phases in a lighting design process: planning, conceptual, and development, all paralleled by constant communication with the clients.
- In order to render the lighting in certain rooms, accurate and realistic surfaces were applied to the interior spaces and exterior structures, including carpeting, slate floors, painted walls, stainless-steel appliances, and wood kitchen cabinets—important elements not only aesthetically, but because their reflectance values would affect the overall illuminance, or light level, in the space.

Introduction

The moments leading up to a lighting design are exciting and unique to each new project. This past fall, a select group of graduate students from the Lighting Research Center (LRC) at the Rensselaer Polytechnic Institute (RPI) in Troy, New York, was asked to design the lighting for an exemplary home/office complex at The Sea Ranch development in Sonoma County, California. They would place some science behind the art and base their lighting design on research-based evidence. Readers of this magazine are, by now, familiar with the complexity of the Optimum Performance Home™ endeavor. For Sandhya, Nancy, Robert, and Justin, it can be likened to carving into a rough block of marble, so to speak, to chisel out a smooth and timeless statue.

The lighting design process always begins with the clients. Gaining an understanding of their lifestyle and the vision they have for their home is foremost in beginning to assess what the lighting solutions will be. A curious phenomenon is that, many times, the clients do not really know what that vision means in term of lighting. They know the furniture they're using and the location of all the television displays; they know the material their countertops and ceilings are—but lighting is somewhat intangible.

Lighting, if you think about it, is more a sensory than a spatial experience; therefore, not always simple to describe.

(Figure 1) Plan view showing soft exterior lighting from the front parking area, plant beds (left), and garages through the entrance and vestibule to the rear courtyard, where color-changing LEDs illuminate the glass block walls flanking the hot tub. All lighting projects downward, respecting The Sea Ranch zero-light pollution policy.

The contrast between light and dark, the transitions and shadows, whether deliberate or accidental, can stir a memory, hint at an emotion—or shout out an invitation for fun and laughter. Creating a lighting language and communicating it well to all members of the design team is critical to a successful design.

The design, team with whom we collaborated for the Optimum Performance Home, included the owners/clients, architectural designer, lighting consultant, interior designer, and biophilic designer. Our challenge was unique in the sense that this home was to represent all things not only good and sustainable, but technologically leading-edge as well—and it was to accommodate both a family and a work environment. We also did not have the luxury of a site to visit or architectural structure to review. We were in the middle of our fall semester in Troy, and the project was in Sonoma County, California. We were equipped with two-dimensional (2-D) drawings and expectations to integrate great lighting into an environmental model for homes in the future. The components to consider were many: this home aimed to be sustainable in materials and operation, adhere to universal design principles, respect the biophilic needs of human beings, and comply with Leadership In Energy And Environmental Design (LEED®) For Homes criteria. Energy-efficiency was implicit—but it also had to have a wow! factor. Oh, and did we mention the electronics?

There are three main phases in a lighting design process: planning, conceptual, and development—all paralleled by constant communication with the clients. We would take this project through the conceptual phase. Gary Reber, Editor-In-Chief and Publisher, and Marlene Reber, Executive Publisher, of *Ultimate Home Design* and *Widescreen Review* magazines, and the owners/conceptual designers of the home, have a wonderful team of experts assembled to make this home come to life—and we were privileged to collaborate with them. They provided us with as many architectural details and specifications on materials and furnishings as possible upon request. The planning stage for us began with a phone conference back in September of 2006, since geography precluded an actual meeting.

Through The Clients' Eyes

The students had to be able to see through the clients' eyes to determine what it was they wished the clients and visitors to see, what message they wanted the lighting to send—where it should be subtle and where it should be bold. They considered the house and grounds holistically, then divided the whole into sections that they each could address. They worked together to make sure the effect was cohesive, yet each area took on a distinct identity.

From their interview with Gary and the design team, the students developed their design intent, identifying lighting objectives consistent with sustainability, universal design, energy-efficiency, and the zero-light pollution policy of The Sea Ranch. In their words:

The Optimum Performance Home at The Sea Ranch, California has been designed as a place that will promote:

- Aging-in-place
- Comfort for people of diverse physical and sensory abilities
- Sustainability
- Energy-efficiency

It will utilize the best of today's products and building methods to demonstrate how they can make life:

- Safer
- More comfortable
- More enjoyable
- Friendlier to the environment

The science behind the home targets a structure that will not only use less energy but actually:

- Generate energy
- Be quieter
- More comfortable
- Mesh with its natural surroundings

Our lighting design is structured around the following principles:

For aging-in-place/universal design we have:

- Used recent discoveries to help make the home safer while using only a minimal amount of energy
- All light levels are controllable by dimmers or motion sensors to accommodate multiple age groups enjoying the home
- The master bedroom suite and guest bedrooms will use amber LEDs as a way-finding device, to provide enough light to lead the occupants to the bathroom safely without fully waking them or others in the room
- These lights will switch on via motion sensors located above the bed (at a height not to be activated by the family cats) to prevent fumbling for switches, and consequently trips and falls
- Blue LED tile located in the master bathroom to enable regulation of circadian rhythms
- This will allow for healthier sleep patterns
- It is conveniently located near the Japanese soak tub so doses of blue light can be received during relaxing bath time

For energy-efficiency, we have:

- Complied with strict light pollution rules of The Sea Ranch community and California Title 24 regulations, which dictate lighting energy use
- Used high-efficacy lamps whenever possible
- Implemented our design in such a way as to accomplish these things without taking away from the comfort and warmth that one would expect to feel when they are home

With a set of preliminary architectural plans before us, Gary walked us through the three buildings of the complex, explaining in detail the structural materials selected, and the intended function of each space. Robert, Sandhya, Justin, and Nancy asked Gary specific questions, such as how often he and his wife entertain, a sample of their daily schedules, where they spend most of their time, wall colors, furniture style, height and placement of each piece of furniture, consideration of mechanical shades for daylight control on windows, etc. Basically, how did they want to feel in their home, and what feeling did they want the home to project?

Areas Of The Optimum Performance Home Each Student Chose To Design

Gary reinforced that the view from outside the front entry through to the courtyard and vestibule should be transparent, that's why it was designed to be predominantly glass. To conjure up a mental image for the lighting of this area, the students were asked to answer the following questions:

- Picture yourself standing in the vestibule and looking toward the kitchen, then toward the courtyard, then toward the entry, then walking toward the staircase to the library/home theatre/surround music room. Then picture yourself standing in each of those four areas looking toward the vestibule. What will be the most effective, discrete way to light the vestibule since it acts as such a bridge between these areas?
- As the lighting designer, if you were driving up the Sonoma County coast and entered The Sea Ranch development at night to visit your clients, what overall impression would you want your Optimum Performance Home to give?
- Now answer the same question as if you were the homeowner.

Thinking in these terms led to a clear image of the desired effect; now they had to develop the details that would satisfy the multiple criteria associated with the Optimum Performance Home. They accomplished this through a careful choice of luminaires (recessed, wall-mounted, suspended, track, or custom) light sources (incandescent, including halogen); fluorescent, both linear and compact, or light emitting diodes (LEDs); light source efficacy (lumens per watt); color (warm or cool) and distribution of light sources (narrow or wide beam spread, and everything in between); and available mounting locations and controls (switches in accessible locations, including dimmers and motion sensors). Integration and compatibility with the extensive electronic systems throughout the house had to be considered as well—would the frequency of the lighting components interfere with any of the audio/visual equipment in virtually every room of this house?

The students derived 3-D models from 2-D drawings. Using Lighting Analyst, Inc. AGI32 software to render the lighting in certain rooms, they applied accurate and realistic surfaces to the interior spaces and exterior structures, including carpeting, slate floors, painted walls, stainless-steel appliances, and wood kitchen cabinets—important elements not only aesthetically but because their reflectance values would affect the overall illuminance, or light level, in the space. Lighter colors (higher reflectance) result in a brighter appearance than darker colors (lower reflectance). Stickley furniture was re-created in the living room and dining rooms, actual lighting fixtures reproduced, and Armstrong wood-paneled ceilings brought to life in rich honey brown tones. While no electronic program is perfect, these renderings help to effectively portray the intended concepts, making this a valuable tool when trying to convey the vision for lighting to the client, comparing expectations, and making adjustments before equipment is ordered and installation is in progress. Halfway through the students' part of the project, which spanned six weeks, we scheduled another phone conference with Gary and team. During this call the students presented their initial concept by PowerPoint, which was e-mailed to everyone involved ahead of time, allowing them to follow along slide by slide, giving us feedback and prompt discussion before we proceeded with the final design.

Justin, who is completing his undergraduate work in architecture at RPI, was part of our graduate-level Lighting Design class at the time. His concept for the exterior is as follows:

To create a lantern effect, visible from the approach to the house, and a glow that warms the house from within, Justin concentrated on the front entry, continued through the vestibule, and out to the courtyard. He saw the lighting as very understated, its effect unfolding quietly as one moved from the farthest point on the driveway to the heart of the courtyard (Figure 1).

The lighting objectives he sought to meet for the entrance and courtyard are as follows:

For both the entrance and courtyard, Justin adhered to the zero-light pollution policy of The Sea Ranch—no light directed upward—and provided modest light levels for all outdoor areas. At

Lighting Analyst's AGI32

Lighting Analyst's AGI32 is a visualization program that allows the user to import a 3-D drawing, apply surface textures such as brick or stone or sheet rock; choose colors and patterns from a library of choices; insert windows and doors. You can then choose the exact light sources to be used from manufacturer-provided specifications—incandescent, fluorescent, LED—and position them exactly as they would be in the room. The manufacturer spec sheets supply a photometric, or light measurement, file with values that you can import into the program. This photometric file characterizes the distribution and color of the light source; AGI32 then ray-traces the movement of the light, or number of bounces the light takes before reaching its final destination, and finally renders the effect as closely as possible to how it will look in your space.

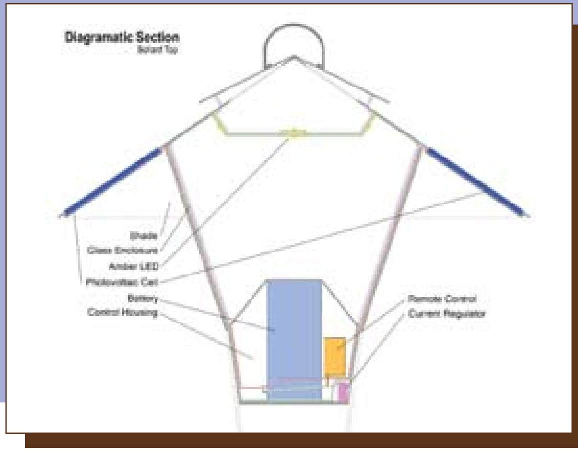
Ballast Specification

To ensure that dimming these fluorescent luminaires would not interfere with other electronic equipment in the home, I researched ballast options and specified one with these characteristics:

- Programmed Rapid Start Ballast
- Low total harmonic distortion (THD) throughout dimming
- Frequency of operation between 25 kHz and 38 kHz.
- Electromagnetic interference (EMI) will not interfere with infrared (IR) devices
- 63rd Harmonic before entering 2.4 GHz range where most WiFi and other RF products operate. This means EMI is negligible for these devices.
- Ultra Quiet
- Can operate two or three lamps

(Figure 2) Photovoltaic bollard on wheels (left); with canopy detached (top right); light distribution (bottom right)

(Figure 3) Section of bollard canopy, housing battery, PV cell, LEDs, and current regulator, as well as glass enclosure, which can be clear or tinted



the entrance, he added soft illumination around the perimeter to invite guests and visitors, and low-profile accent lighting on the plants in the plant beds. In the courtyard, Justin chose to use natural materials (copper), sustainable materials (LEDs contain no mercury), and low energy in the form of photovoltaic (PV). To create atmosphere, he added color-changing lighting for the glass block surrounding the hot tub, and to provide flexibility for the multiple courtyard activities—such as cooking, gathering, and hot tubbing—he supplied a portable lighting solution.

Justin's design is multifunctional. He created a custom luminaire that is flexible, portable, and sustainable—one that would recharge itself both by solar and electric power; and that would literally act as a lantern, able to be placed around the courtyard as needed, with a removable canopy that could sit on a table, hang from a wall via bracket or hook, or sit on a post top to illuminate a parking area. LED sources tucked up into the canopy of the luminaire reflect off the natural copper and cast a sunset hue on pavement or tabletop. (Figures 2-5)

Robert, Nancy, and Sandhya describe their roles as follows:

In Robert's words:

To create a visual environment that provides enough light and flexibility for the multitude of activities that take place, Robert considered the following:

Kitchen

For the kitchen, the design challenge was to be flexible with the lighting, while satisfying California's Title 24 energy requirements, and not allowing light to leak through skylights! First and foremost, we must know what our limitations are. Title 24 mandates that we use at least 50 percent high-efficacy lighting in the kitchen. Despite popular opinion, LEDs do not quite fit this description yet. This means 50 percent of the lighting wattage in this kitchen must be fluorescent. This is why most kitchens you see in California have recessed linear fluorescent lamps.

This sounds like a forced, but practical solution, except for one thing. This kitchen has no plenum, meaning that all our luminaires must either be wall-mounted, pendant-mounted, or track-mounted. Track lighting is fine for a restaurant or a retail store, where specific things need to be highlighted, or for intimacy; but for this home, something a little more traditional is called for. Wall-mounted fixtures can be effective, as well as aesthetically pleasing, but high wall-mounted downlights scream outdoor lighting to me. Again, not something I'd want for a home interior. Thus, pendant lighting seemed to be the appropriate solution, but one that needed to be approached with care. Too few pendants can provide too little light, whereas, too many can appear cluttered and visually unappealing. Also, we had skylights to avoid and varying ceiling planes to manage.

We needed a solution that would provide ample light that could be directed onto the right places (sink, stove, countertop, etc.)—something subtle, that could almost blend with the ceiling. Speaking of the ceiling, I have a riddle. What do you get when you mix a dark, wood ceiling with a bunch of pendant-mounted downlights? An even darker ceiling! This will bring down the apparent height of the ceiling and almost make you feel like you're in

a cave. This is a lighthearted way of strongly suggesting that we need to shed some light on the ceiling as well.

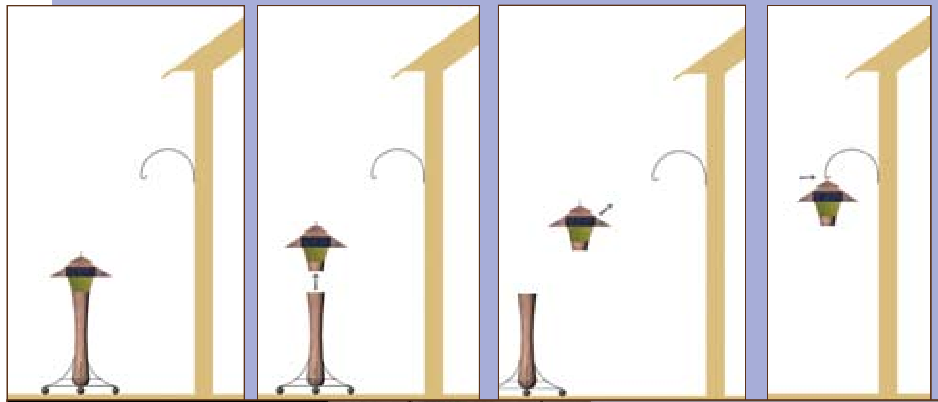
Since this is a unique problem, it requires a unique answer. We developed the design for a custom pendant fixture. This fixture is an H-channel fixture, which gets its name from its shape—from the side view it looks like an "H." This H-channel is 4 inches high and 3 inches deep. It has two sections, one for uplight and the other for downlight, or both uplight and downlight. Both sections are designed to house a T-8 linear fluorescent lamp, strip fixture, and remote ballast. However, not all sections will house all components—some of these sections may be empty, depending on the desired function of the fixture at a given part of the room. From the outside, this fixture will be configured to appear as a continuous unit around the contour of the room, following the run of cabinets and the shape of the kitchen island. It will have a finish to match that of the ceiling. All these details combine to make the fixture as unnoticeable as possible.

The kitchen island, shown in Figure 6, will have a glass surface around the outer edge for casual dining. We wanted to provide a lighting solution that would highlight the glass, as well as provide a warm and intimate dining experience, a situation in which fluorescent wouldn't work as well as incandescent. Taking into consideration the stainless-steel appliances, we chose stainless-steel incandescent pendants. This solution will match the theme, suit our mood-lighting needs, AND satisfy California Title 24 total wattage requirements. Figure 7 shows an overall view of the kitchen and master bedroom areas. (Did we mention that there are very few walls in this house?)

Master Bedroom Suite

The LRC has recently completed studies identifying lighting techniques that might make nighttime safer as well

(Figure 4) Progression from rolling base to free standing lantern



(Figure 5) Versatility of portable bollard; arm-mounted on parking area wall (left), on courtyard wall or outside garages (center), and with canopy removed from base to act as lantern on table top (right).

(Figure 6) View from dining room of kitchen and island featuring a universal design wraparound thick glass eating surface. The lighting fixtures complement the all-stainless-steel appliances.

(Figure 7) Plan view of kitchen area on the left and master bedroom on the right, with lighting zones highlighted in yellow.

as help regulate sleep patterns. What better place to put these ideas to work than in the master bedroom suite? (I'll further explain what these lighting techniques are in a minute.) Thus, the lighting design concept for this room was to incorporate these techniques, plus a fun one, without diminishing any of the style the homeowners would expect from their bedroom.

The first lighting technique is being used more and more commonly in senior living facilities and is based on the fact that most accidents in these residences happen at night when people wake up to go to the restroom. Whether from walking to the restroom in the dark or searching for the switch in the dark, accidents are more likely to occur at this time. What we installed was a set of amber LED pathway lights leading people from the bed to the restroom. Why LED? This application is a perfect fit for them. They provide a moderate amount of light without consuming much energy. Why amber? There is a certain familiarity and warmth within the color amber. It provides a soothing and non-intrusive light that can guide you to the restroom without really waking you, like brighter or other colored lights might, and they will allow you fall back to sleep faster.

The next lighting technique deals with what is called your circadian rhythms. Your circadian rhythm is your daily 24-hour cycle. A general problem among older people is that they go to bed very early and they get up even earlier. Also, has anyone noticed how you feel more chipper during the spring and summer versus the winter? It turns out this has a lot to do with the amount of light our eyes get. I'm not going to go into the scientific details behind it all, but if you would like to learn more please visit: www.lrc.rpi.edu/programs/ lightHealth/overview.asp (numerous fascinating articles can be found here on the subject). It was discovered that we can help regulate our sleep/wake patterns (and other daily patterns, for that matter) by adjusting light levels and exposure time. Another study revealed that blue light is up to 30 times more effective at achieving circadian response than white light (Figueiro, 2005). For these reasons, we specified an artistic LED light fixture that will be programmed to use only blue LEDs. Since the doses of blue light should not be given at bedtime, but hours before, we decided that locating it on the Japanese soak tub wall would be a soothing and effective way to receive blue light therapy.

"Fitting Room"

Have you ever bought an article of clothing from a store because you fell in love with the color, only to find that it just wasn't the same when you took it home? This is not your eyes playing tricks on you. Different light sources provide different spectra, meaning that colors may appear different as you move them from one place to another. Although this next lighting idea isn't scientific or profound, it seems to make sense. Outside the master bedroom closet, there is a fitting area where three mirrored doors fold out to create a fitting room similar to ones you'd find in high-end

(Figure 8) In an area that acts as a fitting room, providing multiple lighting conditions allow the homeowners to see how they would look in different environments. Here, both high-color rendering and cool-color temperature fluorescent track heads contrast with warm halogen track heads. The track system accommodates both, so either or both can be used at one time; track heads shown are by Lightolier (www.lightolier.com).

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clothing stores. What we did with this is provide a track-lighting system that offers light from the two most popular light sources: fluorescent and halogen incandescent (Figure 8). Ridding yourself of the "oh-so-familiar guessing game," you'll know just how you'll look under each lighting condition.

We also used a couple of lighting design techniques to add that touch of class that I previously said we shouldn't be without. The master bedroom suite has a set of French doors leading to the courtyard. We designed a valance above these doors to give a plentiful amount of high-color rendering fluorescent downlight that will make the colors in the room jump out at you. Also, to add to the character of the room, and in keeping with the sustainability theme, we specified energy-efficient Japanese cedar wall sconces to flank the wall-mounted widescreen flat panel HDTV. They will mount just above the in-wall loudspeakers.

Do you remember the answer to the riddle from the kitchen design? If you do, you might be wondering why we don't have uplighting in this room, despite the fact that there is a pitched ceiling. That is because directly above the bed is a large skylight that will allow people to view the stars while lying in bed. This adds a tremendous amount of character and romance to the room, and we didn't want to take away from that. We feel that all of these lighting ideas will make this room safe, fun, and elegant, all at once.

Nancy describes her concept:

Walking along the vestibule on the first floor, we reach another part of this house, which consists of the guest bedrooms on the second floor, and a library/home theatre/surround music room on the third floor, in addition to a guest bathroom, laundry room, and workshop on the first floor.

(Figure 9) Diffuse glass indirect pendant; style is compatible with other decorative luminaires throughout the home, and screwbase CFLs of appropriate size and color can easily replace the incandescent lamps specified. Note, however, that if the lamps aren't pin-based, they wouldn't qualify as high-efficacy under California Title 24, in which case the luminaire should be on a dimmer, requiring dimmable Compact Fluorescent Lamps (CFLs); a sloped ceiling adaptor for mounting is also necessary; pendant shown is by Arroyo Craftsman (www.arroyocraftsman.com).

(Figure 10) Cove conceals LED strips, aimed to accentuate ceiling detail with an amber wash

Guest Bedrooms

The homeowners naturally want to provide their guests with a feeling of warm hospitality by creating a pleasant guest bedroom that will accommodate visiting friends, relatives, business associates, and, possibly, future caregivers. The lighting should be welcoming, comfortable, and easy to control; and, it should be healthy and suited to all ages, as per universal design.

Bedroom lighting typically consists of some combination of pendants, table lamps, and swing-arm wall sconces. We chose the following for this home:

- Craftsman style, consistent with the classic tone of the whole house
- Diffuse yellowish shades to provide warm, soft ambient light
- A diffuse glass pendant that provides indirect uplight to protect eyes from the glare of the light source and enhance the lines of the sloped wood ceiling (Figure 9)

In addition:

- Way-finding light

Again, stemming from universal design principles, navigating the room safely is important. Imagine waking up, leaving the bed and walking to the bathroom during the night; the lighting should prevent you from falling or bumping into objects on your way. In other words, the lighting should guide you around the room without startling you, as turning on a typical light would do.

To achieve this, diminutive coin-sized, motion-sensor-activated LEDs are installed along the lower wall from bedroom to bathroom, providing an amber glow and turning on automatically when guests wake up and their feet touch the floor. The

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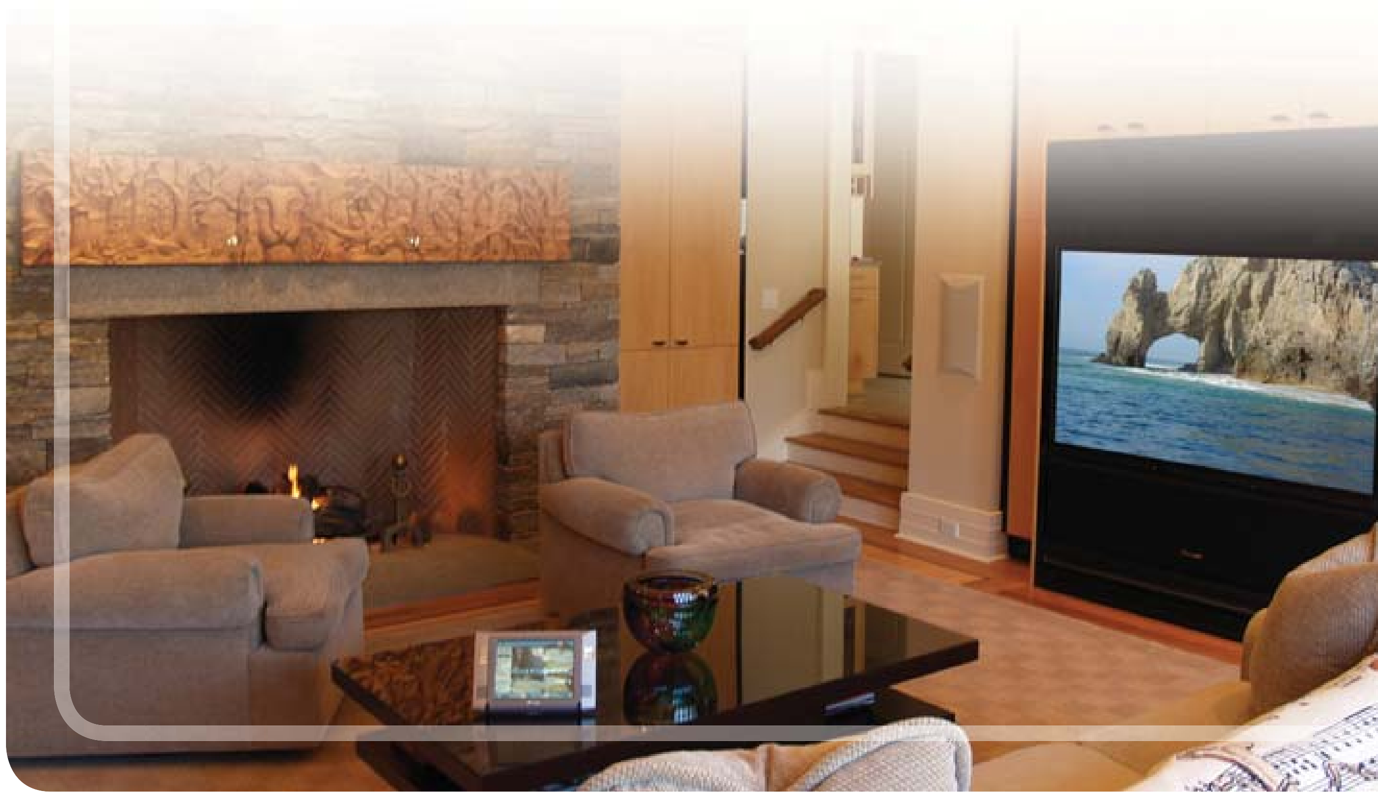

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Recommended Light Levels

The Illuminating Engineering Society of North America (IESNA) includes recommendations for various tasks within a home. For serious reading while seated in a chair, for example, the IESNA recommends 50 horizontal foot-candles (hfc) and 10 vertical foot-candles (vfc); for casual reading, they recommend 30 hfc and 5 vfc (Rea, 2000). This would determine the amount of light you provide for a chair in the library, for example, compared to a swing-arm lamp by the bed.

amber color is selected because it is closest to traditional incandescent, a familiar and comfortable source. In general, LEDs are easily controllable; they require a small profile driver, which controls the current supplied to the LED units, and in this instance their power supplies can be concealed in the guest room closets.

- Energy-efficient light sources

In the absence of a suitable ENERGY STAR® luminaire that uses pin-based Compact Fluorescent Lamps (CFLs), warm-toned CFLs, with a correlated color temperature (CCT) of about 2800 kelvin (K), replace incandescent lamps in luminaires whenever possible.

Deck

A covered deck extends across both guest bedrooms. To accommodate the zero-light pollution policy—no light aimed upward—light is contained within the deck. Wall sconces with opal glass shades provide a warm, diffuse light. The four wall sconces, two outside each guest bedroom door, can be controlled either independently or all together by guests in each bedroom.

Library/Home Theatre/Surround Music Room

Books can spark ideas, and good lighting is the best tool in that regard. Since your eyes play such an important role, the lighting in the library must be sufficient for reading. The library's area is not large, but seems so because of its high pyramid-shaped ceiling capped by a skylight. We chose to use:

- Floor lamps—shaded floor lamps are ideal since they shield readers' eyes from the light source while directing the light where it's needed for reading
- Bookshelf lighting—two-headed luminaires that provide indirect uplight and wall washing at the same time; books on the shelves are illuminated, and the ceiling is also accented indirectly
- Wall sconces—wall sconces emitting soft, warm light enhance the ambience of the library
- Ceiling—the skylight, admitting abundant daylight during the day, becomes dark at night, as does the ceiling around it. From an aesthetic point of view, the ceiling should be softly lit. Amber lighting is designed to wash down from the four sides of the skylight along the ceiling surface and present a gradient of brightness, enhancing the sophisticated structure of the warm wood ceiling

To respect The Sea Ranch policy on light pollution, a narrow wood cove is located at the seam where skylight meets ceiling. Low-profile, high-output amber LED strips are concealed within the cove to shield a direct view of the light source and to prevent light from escaping through the skylight (Figure 10).

Library Gallery And Library Staircase

The library staircase is a prominent link between the guest bedrooms and the library; therefore, it needs to be safe, attractive, and carry the theme from one room to the next. For older adults, providing contrast at transition points is essential. Ambient light alone can project disturbing shadows on the floor, so LED strips emitting diffuse amber lights are mounted under the nose of each step. The amber glow is consistent with the LED coin lights in the guest bedroom and the cove light illuminating the library ceiling, providing a subtle continuity between the living area and the study area (Figure 11).

The wall along the staircase from the ground floor to the library acts as a gallery where art pieces are exhibited. Traditional artwork lighting applies warm (low CCT) halogen MR16s to accent the artwork. Here, to create a deliberate contrast between the lighting on the artwork and the warm lines of light at each step up to the library, cool LED MR16s (high CCT) accent the artwork (Figure 12).

Car Garage And Boat Garage

To illuminate the car garage and boat garage, the idea is to provide uniform lighting that minimizes shadows around the vehicles and allows one to work in the space. So, the lighting in these non-living areas should be simple and efficient. We've chosen fluorescent sources for the two garages, which have higher energy-efficiency and long life; opal lenses conceal glare from the light sources. And, just for fun, we've mounted a whimsical low-voltage nautical-looking lighted "rope" (Boalum by Artemide) to the wall for some boat garage art!

Sandhya says:

When we first started on the project we only had plans, some basic interior elevations, an overall view of the site, and very good input from the clients. So we started by imagining a lot of things and soon we realized that we needed some solid drawings to look at. The pitched ceilings were very difficult to visualize without 3-D drawings. We started the project by creating a 3-D interior view using AutoCAD. Then we used

Lighting Analyst's AGI32 software to test and experiment with our lighting design.

Living Room And Dining Room

Though the living room, dining room, and kitchen areas are part of a single, big space, all the areas have a character of their own. For example, the living room has a dynamic ceiling, stone fireplace, and Earth Weave wool carpeting, while the dining room has a high ceiling and Kährs wood flooring, and the kitchen has a partially sloped ceiling and Evergreen natural slate flooring. It was necessary to design each space individually, without losing the continuity of the whole area.

To design the lighting for a ceiling with more than five different planes and two big king post ceiling trusses was a challenge in itself. This complicated, yet beautiful, ceiling gave us a very good opportunity to bring out the form and architecture of the building. The seam of the hip and valley beams (where the ceiling changes plane) was highlighted using unobtrusive low-voltage accent lights near the wall plate. The warm color of halogen was used to bring out the richness of the honey brown wood ceiling. The main problem that we faced while selecting luminaires was that the ceiling had no plenum, so we had to select luminaires that are small and could be tucked behind the beams. We grazed the stone texture of the fireplace using discrete, adjustable low-voltage monopoints. In addition to the architectural lighting, we used decorative wall sconces and downlighting to create a magical and warmly lit environment. Prairie-style wall sconces that coordinate with the dining room chandelier within view enhanced the intimacy of the window seats and complemented the overall interior design theme. The wood door that conceals the six-foot wide Stewart Filmscreen® CineWide rear-projection screen, when not in use (not shown in rendering), is washed with soft accent light (Figure 13).

The multi-use living room has a very special place in this house. Sometimes it will be used as a very private and intimate space for reading books; other times it will be used for watching movies on the state-of-the-art performance home theatre system, while sitting on the D-BOX®/Fortress Seating "kinetic" sofa and enjoying a beverage; sometimes it will be used as a family gathering space; and other times it will be used for entertaining guests. So, our challenge was to design lighting for these different scenes or moods.

Most of it can be achieved by dimming the light levels using controls; the rest by simply turning off certain fixtures. For example, for a very private and intimate use of the window seats for reading, the wall sconce for task lighting and the downlight for ambient lighting can be turned on and dimmed. This can save energy without sacrificing functional or aesthetic needs, and also complies with California Title 24.

The same is true for the dining room, where different scene

Figure 11. View from the lower floor up to the library ceiling and skylight.

Figure 12. Contrast between cool lighting on artwork and warm amber light delineating stairs.

(Figure 13) Rendering of living room and dining room, showing the many planes of the beautiful wood ceiling; the soft grazing of the beams at the seam as one ceiling plane meets another, the accent lighting on the stone fireplace wall, general downlighting on the sofa and chair; the prairie-style dining room chandelier; the coordinating sconces above the window seats, and the subtle downlighting onto the table from the accent lights above.

settings, ranging from a very private and intimate setting to a party setting, can be created at the touch of a button, by turning off or dimming the lights. In this area, the prairie-style chandelier provides ambient light but also makes a statement as part of the furnishings of the room. Its height is lowered to about 30 inches above the table to reduce the scale of the massive dining area and to create a more intimate space. The recessed low-voltage downlights at either end of the table do the real work; they will not only add sparkle to china, crystal, and food, but will reflect off the table to make the people seated all around look great, which is the most important consideration in most situations—it's always about the people first. Another focal point here is the use of LED strips within the china cabinet to call attention to the objects on display.

How this lighting design addresses the following:

- Sustainability—use of LEDs, which contain no mercury; use of natural materials when possible, i.e. the copper construction of the portable bollard
- Universal Design—location of switches: not higher than 42 inches above the floor and in accessible locations, not hidden behind appliances or cabinets; wide toggle design for easy manipulation; aging eye considerations such as shielded light sources, way-finding lights in bedroom/bathroom areas; downlighting integrated into grab bars; blue light wall tile for circadian regulation
- LEED For Homes—energy-efficient lighting, including ENERGY STAR fixtures, where appropriate; controls, such as dimmers, motion, and occupancy sensors
- California Title 24—50 percent lighting in kitchen area must be high efficacy, which is defined as pin-based compact fluorescent lamps (CFL) with electronic ballasts (achieving a minimum of 50 lumens-per-watt for wattages higher than 40); lighting in bathrooms, garages, laundry and utility rooms must be on manual on occupancy sensors; all other rooms may use incandescent or low-efficacy sources, but they must be on dimmers
- Advanced Technology—use of LED sources where appropriate, i.e., where linear lighting in tight spaces is warranted, where use of color is desired, where easy controllability is necessary

Luminaire And Product Selections

The manufacturers we've selected for this lighting design are numerous and varied due to the specific, sometimes custom, solutions required throughout the home. The driving factor behind most choices was the appropriateness of the luminaire for the area it would light, and the quality of its performance, based on our experience with the product itself or the reputation of the manufacturer. While hundreds of similar luminaires say they do the same thing, not all actually do. For an adjustable low-voltage accent light, for example, the ability to add accessories, such as lenses and louvers, is important. Without those options you are limited in your ability to finesse the design. It's often said that the devil is in the details—and nowhere is that more evident than when selecting a solution that simply won't fit, adapt, or adjust as you'd intended. The type of lamp (bulb) it accepts, its range of adjustability, type of optics, the ability of a socket within a fixture to hold the lamp captive, or the ability to maintain a fixed focus, characteristics of ballasts and transformers, sharp or roughly finished component edges, non-corrosive materials that withstand weather and soil elements over time—all are factors that affect the performance and durability of fixtures, and all will affect the long-term maintenance and integrity of a lighting design.

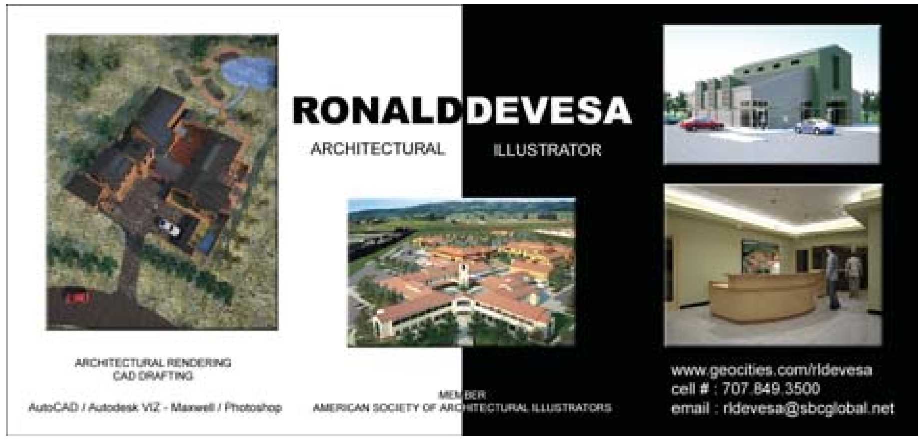
Minimizing the number of manufacturers and products simplifies purchasing and maintenance for the homeowner. Whenever possible, we tried to use as many offerings from one manufacturer as possible to satisfy multiple applications. However, meeting the many criterion before us resulted in a somewhat long, not-so-simple list, especially since there are custom items involved.

Selections for this project include, for example: the custom H-channel designed for the kitchen—Robert selected the Lutron ballast that would operate multiple lamps quietly, with minimal interference to other electronics. Also for the kitchen, Alkco's T5 fluorescent under-cabinet luminaire because it has a relatively small profile, uses a high-frequency electronic rapid-start ballast, and premium long-life lamp (20,000 hours) with good color rendering. Lightolier's stainless-steel pendants were chosen for their light distribution, and also to complement the stainless-steel appliances and have a presence over the island; Arroyo Craftsman and Kichler presented several beautiful options for the prairie-style pendants and sconces throughout the house; Cooper Lumière's low-voltage exterior luminaires are of small enough scale to be unobtrusive in the planting beds, can be aimed downward onto the plants, and allow remote location of transformers; their wall-mounted exterior luminaires work well over the outdoor kitchen grill and sink because of their extension lengths, variety of lamp choices, ability to accept accessories, and non-corrosive composition; Color Kinetics' LED systems satisfy size, color, and light output requirements for the library ceiling cove, and the blue tile in the master tub; io® Lighting's luxrail integrates LEDs right into handrails and grab bars for the master vanity and bathroom, and supplies photometric files to evaluate distribution; OSRAM SYLVANIA has many choices for LED strips on stairs, LED coin lights in guest bedrooms, and glass tile lighting system around the hot tub; Rejuvenation's custom fixtures provide good options for up and downlight on library bookshelves and guest and powder bath vanities; Sea Gull Lighting's surface-mount ENERGY STAR fluorescents for closets and pantry, and copper top pendants and sconces for vestibule, hallway, and dog run; Lightolier cedar sconces are energy-efficient and add to the natural warmth of the solarium and master bedroom; Lightolier track along with halogen and CFL track heads complete the fitting area; Lightolier's Lytetube for the suspended indirect/direct fluorescent system for the home office; W.A.C. monopoints, with electronic transformers remotely located, to maintain a smaller profile and help them "disappear" into the wood ceiling of the living room.

A fixture schedule detailing all selections, including the following manufacturers, was part of the final set of documents delivered to Gary and Marlene upon completion of the lighting design. There are cases where product substitutions are acceptable, upon approval by the lighting design team, and there are cases where no substitution is recommended. As you can see, each luminaire chosen is not just another pretty face—each has a clear reason for being.

Final Comments

The design details for many other areas—such as the home office, projection rooms (living room and Optimum Performance Home Theatre™), workshop, laundry room, utility room, and dog run—are not addressed here or this article would never end—but each has its unique solutions. Halfway through design development, there was a noticeable change in tenor regarding the students' interest toward this project. From merely developing a lighting design as an assignment, it became personal and they began living and breathing the challenge. They wanted to truly integrate lighting that would make a difference, for those who would live there, into the many facets of this home. Their determination to pull this together, to deliver not only interesting concepts



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but the details and documentation to go with them—dominated their days and nights as the semester neared its end—no small task since they were in the throes of finals and other project deadlines. They found themselves questioning some of the existing standards (always a good thing) and seeking answers to questions they didn't even know they needed to ask. They've learned a great deal, are grateful for the opportunity to have been part of such a significant project and design team, and look forward to seeing their 3-D visualizations come to life. UHD

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Gary Reber, Editor-In-Chief & Publisher

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Sandhya Parameswaran received her Bachelor of Architecture degree from the Priyadarshini College of Engineering & Architecture of Nagpur University in Maharashtra, India. She later moved to the United States and decided to apply for graduate studies to pursue her interest in solid-state lighting and building automation through the graduate lighting program offered at the Lighting Research Center.

Rui (Nancy) Qi currently holds a bachelor's degree in Material Science and Technology and a master's degree in Sustainable Energy Systems. She enrolled in the Lighting Research Center to continue her education in pursuit of her MS in Lighting to build on her professional experience and personal interests in the area of lighting technology. Prior to the Lighting Research Center, Rui's work experience includes two years at the Chinese National Lighting Testing Centre in China.

Robert Soler entered the Lighting Research Center with a bachelor's degree in Electrical Engineering from California State Polytechnic University. Robert's "true passion" is illumination. Since the completion of his undergraduate studies, Robert has continued to complete continuing education and professional development courses related to lighting controls for energy management and daylighting controls.

Justin Bosy, who is completing his fourth year undergraduate work in architecture at the Rensselaer Polytechnic Institute, was part of the graduate-level Lighting Design class who mastered this project.

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InSync Home Brings Balance To Living And Technology

Gary Reber

At this year's International Builders Show (IBS), attendees had the opportunity to view the latest in innovative whole-house lighting and audio, with the unveiling of the new InSync Home. The two-story, 6,500-square foot house in Orlando's exclusive Baldwin Park community was designed by architect Bobby Morales of Morales-Keesee Design Associates and features a range of leading-edge technologies, including state-of-the-art integrated lighting and digital audio systems from Loveland, Colorado-based Colorado vNet.

BUILDER Magazine, which sponsors the annual home builders' showcase to coincide with IBS, teamed this year with *Home* magazine, opening the event to more than four million subscribers in the builder and residential homeowner markets. Unlike the typical open house, the InSync Home was not open to the general public.

Behind the home's inspired architecture, an integration of low-voltage technologies offered up a new level of control over lighting and distributed digital audio to every room in the house, employing Colorado vNet's integrated lighting control and Vibe™ audio systems. The system, designed and installed by Winter Park, Florida-based Wilson Technologies, is the result of comprehensive research into what today's homeowners really want.

"We put together several focus groups, before the ground was even broken, and asked people from a wide range of backgrounds and demographics what they looked for in residential technology," reports company president David Wilson. "The common thread throughout was simplicity in design and ease of use. Everyone wants technology to be more in sync with their lifestyles. It's all about connectivity, about convenience, and about intuitive control. The technology has to serve a purpose and adapt to the user. No one wants to have to re-educate themselves to basic tasks we take for granted."

As Wilson explains, the goal in designing the InSync Home systems was to create something that would serve to inspire

both homeowners and builders to look beyond their own pre-conceived notions of home automation. “Traditionally, many builders have tended to look at home automation technology as an afterthought,” he observes. “As a result, they tend to view the design of lighting and other whole-house technologies as separate, rather than integrating it as a part of a holistic design. This was a great opportunity to educate builders about these technologies, how they integrate with both home and lifestyle, and how that integration can be achieved without a great deal of adaptation or re-engineering by the builder. It was a way to come together with the builder and the architect, and say, ‘Okay, how can we integrate technology so that it flows with the home instead of fighting with it?’”

Using Colorado vNet's revolutionary technology, Wilson was able to create lighting and audio systems that are easy to design and intuitive to use. “In the past, many people— builders and homeowners alike—have been intimidated by the complexity of some of these systems,” he observes. “But the vNet system is really well thought out. It’s based on proven technologies—Internet (IP) and Controller Area Network (CAN) protocols are solid, dependable solutions, so we’re not going out on a limb with something untested. From the design perspective, the system is simple to design and configure. The vNet Builder software streamlines the entire process, from designing and diagramming the system to printing up documentation and bills of materials. For the installer, it's a breeze. There are only a few basic parts to the whole system, so the design is uncomplicated, and there's no need to stock a million different SKU’s.”

Utilizing a distributed intelligence system layout, the vNet lighting control brings a unique perspective to creating and configuring a fully modular design that is both flexible and expandable. Custom scenes can include timed, automated sequences, selectable lighting levels, and even time-of-day-based features, using the system’s real-time internal clock. For the homeowner, it represents not only ease of use, but energy conservation as well.

“Their (Colorado vNet) lighting solution is very slick,” says Wilson, “because it eliminates the need for a central dimmer unit. We were able to install a few modules in one of the master bedroom closets, a few in the garage, and some others upstairs. It keeps the wire runs short, and with copper prices going higher all the time, that's a cost savings as well.”

Another useful feature is the ability to pre-program all parameters of the system configuration using the vNet Builder software. “For us, that means fewer man-hours, fast setup, and easy troubleshooting,” Wilson points out. “It keeps the bottom line in check, and gives the client what they want. It also makes any changes, whether during the design-phase or months later, that much easier to implement.

“For us as designers, the ability to simulate everything on the computer is huge. It allows us to give the architect a clear, concise demo of what the system will do, and how it will function. With every other lighting system we’ve used, you can’t create your scenes until you’re out there, on-site. With the vNet system, we can pre-program the whole thing, test it and troubleshoot it, and just send out the program with the installer. It's a tremendous time-saver.”

The house is also equipped with vNet’s Vibe distributed digital audio system, a modular IP-based approach that includes the Vibe Dock for iPod® and AS1-1250/6 Audio Server, which stores up to 1250 CDs in an uncompressed WAV format and streams up to 16 independent audio programs anywhere in the home. The main focus of the Vibe system are the numerous Vibe Color Touchscreen Amplifiers, each of which features a reference-quality, 75-watt digital stereo amplifier for crystal-clear sound, and offers full fingertip control of both audio and lighting, as well as award-winning graphics displays of album art and metadata.

> “Behind the home’s inspired architecture, an integration of low-voltage technologies offered up a new level of control over lighting and distributed digital audio to every room in the house, employing Colorado vNet’s integrated lighting control and Vibe™ audio systems.”

Although any of the 24 Touch Screen Amplifiers can control both the audio and lighting, Wilson opted to create redundant access to lighting, using vNet’s custom TP2-1D Touchpads. “We did it just because we could,” he quips. “The modular design makes it really easy to implement another control. And by using both controls, we're offering the user that many more options.”

“The entire system is really intuitive to use,” Wilson reports. “Everyone who’s come through the house so far just loves it. When I showed the system to the architect for the first time, his first question was, ‘How easy is it to operate?’ I said ‘Here’s the touch pad, try it yourself.’ That's the best way to show people how simple it is—as soon as they get their hands on it, they’re experts. It really showcases itself.”

“This is really a tactile technology,” Wilson concludes. “The hands-on experience is essential. A picture won’t show you how easy it is to use. Once people get their hands on it, the reaction is always, ‘Ooh, I’ve got to have this.’ Colorado vNet is really taking it to the next level.” UHD

The Author

Gary Reber is the President of Ultimate Home Design, Inc. and the founding Editor-In-Chief and Publisher of *Ultimate Home Design*®, The Optimum Performance Design & Build Resource For Environmentally Enhanced Lifestyle Living™. He is also President of WSR Publishing, Inc, which publishes *Widescreen Review*®, The Essential Home Theatre Resource™. His diverse background in several fields includes an undergraduate, graduate, and postgraduate university education in architecture, community planning, and economic development planning. For years he was a consultant on community and economic development planning. For the past 15 years he has been an editor and publisher of magazines in the consumer electronics field. Gary can be reached at 951 676 4914 or gary@ultimatehomedesign.com.

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